Preliminary Stormwater Management Plan

for

Woodspring Suites Hotel

1744 County Road D

Maplewood, MN

Prepared By:

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Peter Moreau, PE

July 27, 2020

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Appendices

PROJECT INTRODUCTION

The proposed project consists of the development of a 2.04-acre site located at 1744 County Road D (PID 032922110005) in Maplewood, Ramsey County, Minnesota. The site is within the Ramsey-Washington Metro Watershed District. The City of Maplewood & RWMWD are the permitting authorities for stormwater management. The proposed site consists of construction of a 4-story hotel and related parking lot & site utilities. Currently the site consists of a vacant & undeveloped grass lot surrounded by streets on all four sides. The net site area less right-of-way for the four streets is 1.68-acres.

Stormwater from the project will be collected into a subsurface infiltration & detention system. The system will outlet to the existing 15" pipe in the southwest corner and will discharge at peak rates meeting the approved allowable discharge rates for the Legacy Parkway master plan provided by City Engineering staff.

The project has been designed to meet the criteria provided by the Assistant City Engineer (Jon Jarosch) that states: "We would require that the proposed site would have its rate controlled such that it is equal to or less than 3.8 cfs for the 10-year storm event. The site will also still be required to meet the City's 1.1-inch over the site impervious volume reduction requirements."

The stormwater system has been designed to meet the following requirements.

- Volume control requirement - 1.1-inches over the site impervious (City of Maplewood and RWMWD)
- Water quality requirements – 90% TSS and 60% TP removals (City of Maplewood and RWMWD)
- Rate Control – Peak runoff rate from ten-year storm event is < 3.8 cfs per Legacy Parkway Master Plan (City of Maplewood, Jon Jarosch)

SOIL CLASSIFICATION

A geotechnical report for this site is forthcoming. Per the USDA Web Soil Survey results, the existing site consists of Chetek sandy loam and is classified as Hydrologic Soil Group A (HSG A). Based on this information, existing soils are suitable for infiltration. The web soil survey results also show no signs of shallow groundwater levels.

EXISTING CONDITIONS

The site currently consists of a vacant grassed lot with 0.01 acres impervious. There is no existing stormwater management on the site. There is an existing 15" storm sewer stub to the lot that was sized and planned for receiving runoff from this lot in developed conditions. The site is relatively flat with slopes ranging from 1%-4%. The site has a high point that splits into 3 directions; north, east and southwest. The majority of the site drains to the southwest corner where the existing public storm sewer collects at Flandrau Street & Village Trail. The public sewer ultimately discharges to the southwest.

Existing Areas & Curve Numbers

Subcatchment	Area	Weighted CN
E1	1.23	61
E2	0.33	61
E3	0.12	61
TOTAL	1.68	

PROPOSED CONDITIONS

The proposed site includes the construction of a 4-story hotel building with adjacent parking lots and 2 driveway access points. The proposed site will include a total of 1.42 acres of impervious, or a net increase of 1.41 acres from the existing conditions. The site drains to a series of catch basins that ultimately drain to an underground stormwater infiltration & detention system. Per the city of Maplewood standards, the existing 15" storm sewer pipe stubbed to the site was designed with the intention of allowing up to 3.8 cfs of peak stormwater discharge during the 10-year storm event for a future development at this site. Proposed drainage areas P7 and P8 will drain off-site and to the existing streets & public storm sewer similar to existing conditions (at rates less than existing conditions).

Proposed Areas & Curve Numbers

Subcatchment	Area	Weighted CN
P1	0.24	92
P2	0.29	92
P3	0.16	94
P4	0.31	92
P5	0.21	97
P6	0.29	98
P7	0.15	75
P8	0.03	61
TOTAL	1.68	

RATE CONTROL

As this site was developed and planned as part of a larger development (the Legacy Parkway PUD) the existing grass conditions of the site create very little runoff in the existing model. Therefore, proposed rates exceed predevelopment modeled rates but per the city of Maplewood's comments, they want the developed site to discharge into the provided 15" storm sewer stub as long as the peak discharge rate doesn't exceed 3.8 cfs in the 10-year event. The existing site drains to the north, east and southwest. In the proposed condition the area to the north is now being captured on-site and the area to the east was reduced significantly. The HydroCAD model is using the rainfall events from the County lookup table and MSE 24-hr Storm Curve 3. The existing time of

concentrations were determined using sheet flow. The proposed time of concentrations were determined using the MnDOT standard for minimum Tc for paved areas (7 minutes) as the areas are very small.

Design Rainfall Events

Storm Event	(in)
2-Year	2.81
10-Year	4.19
100-Year	7.36

Peak Rate of Runoff (cfs)

Storm Event	City Requirement	Proposed 10-yr Discharge
10-Year	3.80	2.33

PRETREATMENT

Pretreatment devices include sumps on the parking lot inlets. The inlets upstream of the system will be installed with a sump to remove initial larger sediments. The ADS StormTech Isolator Row will be the first row to collect runoff entering the systems to supplement pre-treatment removals.

WATER QUALITY

The city of Maplewood stormwater design standards require that the site BMP's achieve 90% total suspended solids (TSS) and 60% total phosphorus (TP) removals modeled on an annual basis.

The Ramsey-Washington Metro Watershed District requires that the site BMP's achieve 90% total suspended solids (TSS) removal from the disturbed area of the project on an annual basis and total phosphorus removals are inherited through the volume control policy.

These requirements will be met with the installation of the subsurface infiltration system. A MIDS analysis was completed to demonstrate compliance. A summary of the annual pollutant load removals for the proposed conditions can be found tabulated below. Please refer to Appendix D for the full results of the MIDS analysis.

Nutrient Analysis

BMP	TSS Removal (%)	TP Removal
Subsurface Infiltration BMP	97	97

VOLUME REDUCTION

The City of Maplewood & RWMWD require volume control of 1.1-inches over all new & reconstructed site impervious area. Since the site soils are conducive to infiltration, an infiltration rate of 0.8 ft/s was used in design since that is the recommended design infiltration rate for HSG A soils from the MN Stormwater Manual. A subsurface infiltration system has been designed to meet the volume reduction requirements. A summary of the infiltration calculations is tabulated below.

$$Required\ Infiltration\ Volume(ft^3) = V_{inf} = 1.1(in) * \frac{1\ ft}{12\ in} * New\ Impervious\ Area\ (ft^2)$$

$$V_{inf}(ft^3) = 1.1(in) * \frac{1\ ft}{12\ in} * 61{,}419(\ ft^2) = 5{,}630\ ft^3$$

Volume Control Analysis

New Impervious Surface	61,419	sf
Design Infiltration/Filtration Rainfall Event	1.1	in
Required Infiltration/Filtration Volume	**5,630**	**cf**
Maximum Allowable Infiltration Rate	0.80	in/hr
Required Drawdown Time	48	hrs
Maximum depth to Outlet for Drawdown	**3.2**	**ft**
Provided Infiltration Depth below Outlet	**2.5**	**ft**
Provided Volume Below Outlet	**7,010**	**cf**

EMERGENCY OVERFLOW

The grading design will convey overflow runoff overland through the site should a catch basin or pipe become plugged, or if a rainfall event occurs that exceeds the design capacity of the storm sewer system. In the southwest corner of the site is the site's ultimate emergency overflow at elevation 925.42'. If the underground system were to back up, the site will still overland flow to the southwest into the existing public stormwater system at Flandrau Street & Village Trail. The 100-year high water level in the system is 924.17' which is 7.8' below the LFE of 932.00'. Freeboard requirements will be met.

STORMWATER SYSTEM OPERATIONS & MAINTENANCE

An operations and maintenance manual will be provided as part of the final design and as required by RWMWD & City of Maplewood.

Erosion & Sediment Control

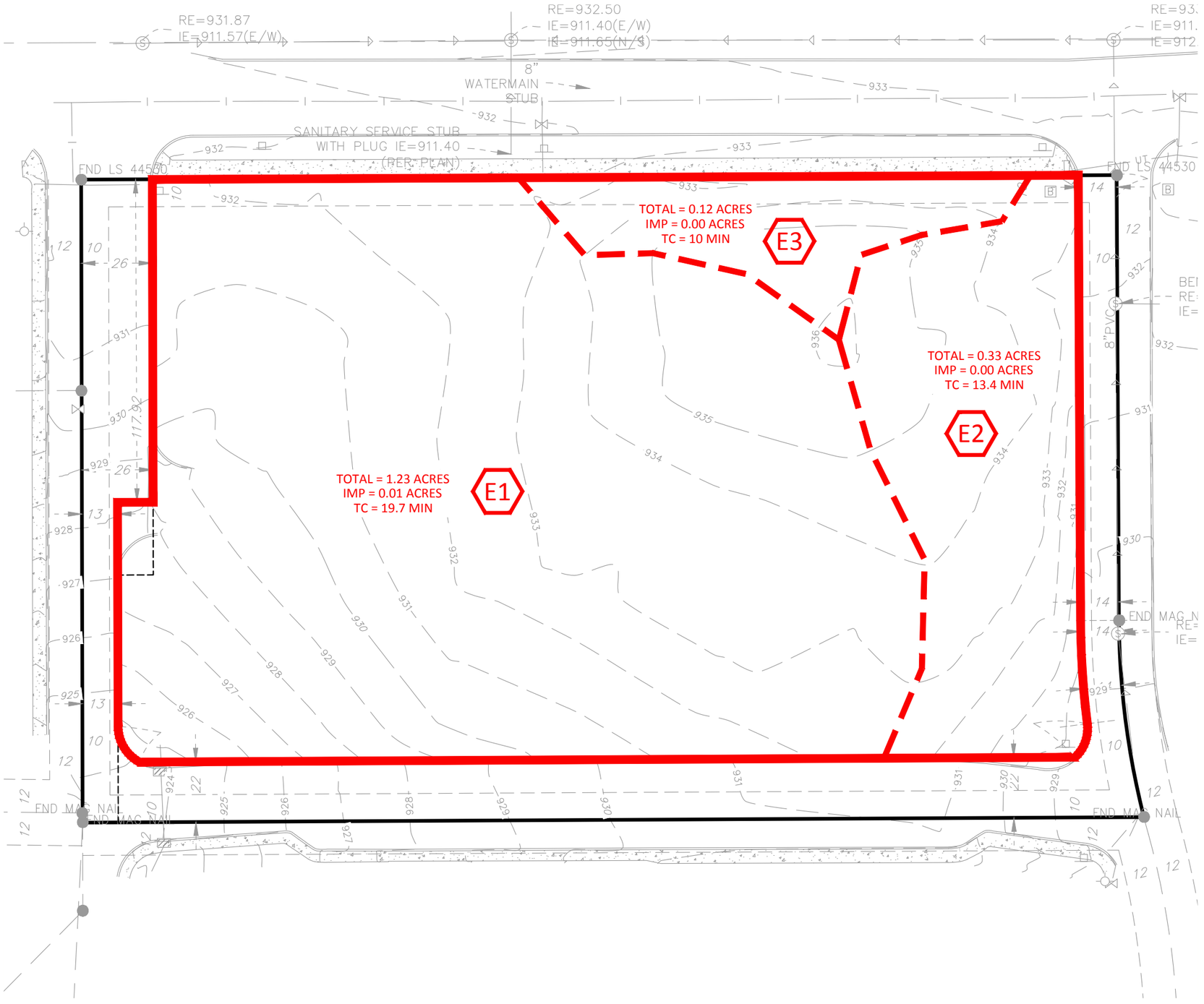
A comprehensive Stormwater Pollution Prevention Plan (SWPPP) meeting the requirements of the 2018 MPCA NPDES permit will be developed as a part of the final plans.

Summary

The proposed Woodspring Suites Hotel project will meet the requirements of the City of Maplewood, Ramsey-Washington Metro Watershed District, and MPCA through construction of an underground stormwater infiltration & detention system. This system will provide the required rate control, water quality, and volume reduction improvements prior to discharging stormwater runoff from the site to downstream receiving waters.

If you have any questions, comments, or additional information regarding this report, please contact me at Pmoreau@sambatek.com or (763) 398-0858.

APPENDIX A – Drainage maps



LEGEND

- XX — LINK
- XX — POND
- XX — REACH
- XX — SUB-CATCHMENT

NORTH

0 1

SCALE IN FEET

Sambatek
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Engineering | Surveying | Planning | Environmental

Client

SOTA PARTNERS

Project

WOODSPRING SUITES HOTEL

Location

1744 COUNTY ROAD D

Certification

Summary

Approved: PSM Drawn: AJR

Revision History

No.	Date	By	Submittal / Rev.

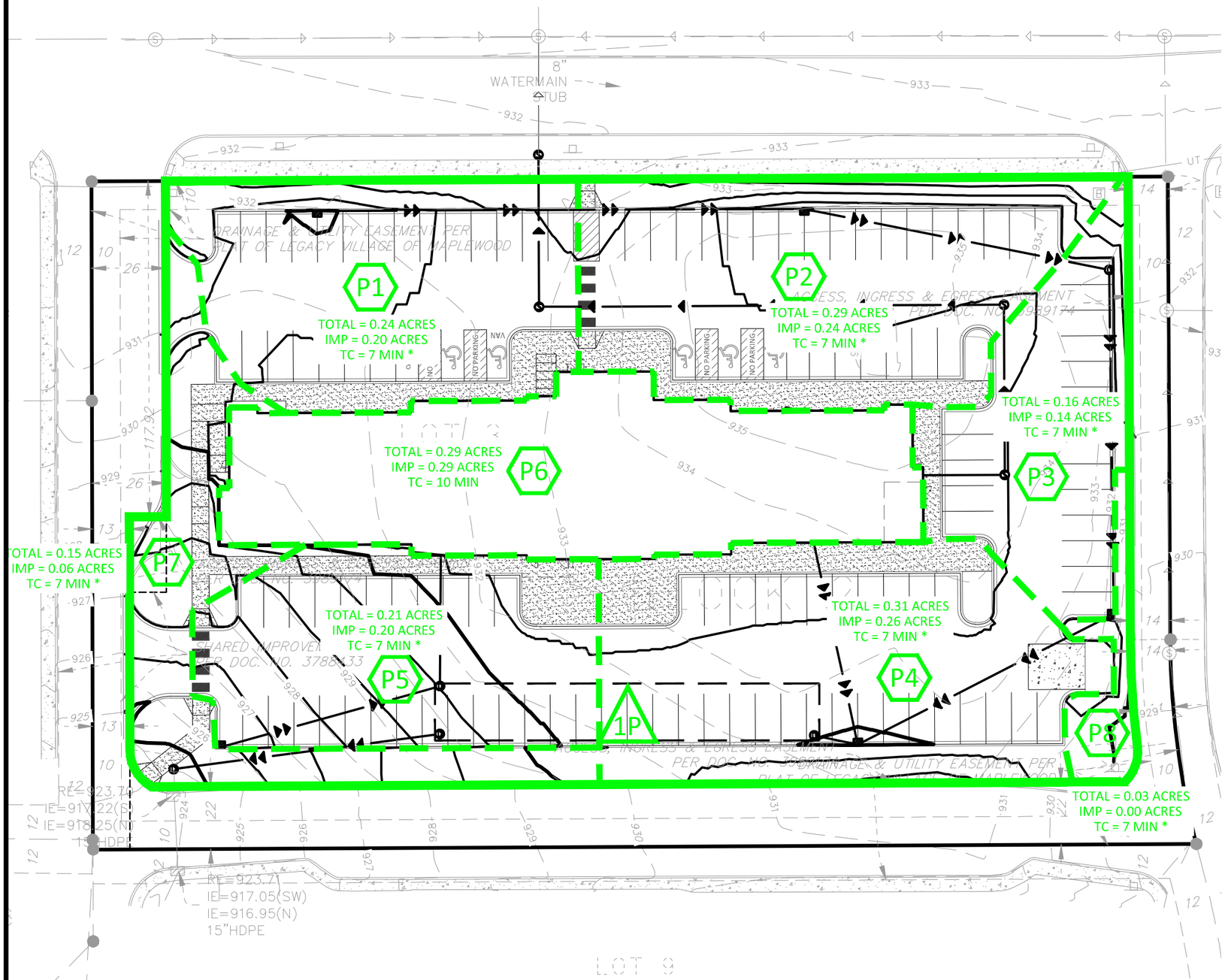
Sheet Title

EXISTING DRAINAGE MAP

Sheet No. Revision

1/2

Project No. 22163



LEGEND

- XX — LINK
- XX — POND
- XX — REACH
- XX — SUB-CATCHMENT

* TC WAS DETERMINED USING THE MNDOT MINIMUM FOR PAVED PARKING LOT SHEET FLOW

NORTH

SCALE 0 1 IN FEET

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Revision History

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Sheet Title

PROPOSED DRAINAGE MAP

Sheet No. Revision

2/2

Project No. 22163

APPENDIX B – Web Soil Survey

Soil Map—Ramsey County, Minnesota
(WSS Hotel in Maplewood)

Map Scale: 1:677 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 30 60 120 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Ramsey County, Minnesota
Survey Area Data: Version 15, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 8, 2019—Aug 9, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
155B	Chetek sandy loam, 0 to 6 percent slopes	1.8	77.0%
155C	Chetek sandy loam, 6 to 12 percent slopes	0.5	23.0%
Totals for Area of Interest		**2.3**	**100.0%**

Ramsey County, Minnesota

155B—Chetek sandy loam, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1t987
Elevation: 800 to 1,950 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Chetek and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chetek

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap - 0 to 8 inches: sandy loam
E - 8 to 14 inches: loam
Bt - 14 to 19 inches: gravelly sandy loam
2BC,2C - 19 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Forage suitability group: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Kingsley

Percent of map unit: 5 percent
Hydric soil rating: No

Poskin

Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Ramsey County, Minnesota
Survey Area Data: Version 15, Jun 5, 2020

Ramsey County, Minnesota

155C—Chetek sandy loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 1t988
Elevation: 800 to 1,950 feet
Mean annual precipitation: 27 to 33 inches
Mean annual air temperature: 39 to 46 degrees F
Frost-free period: 135 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Chetek and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chetek

Setting

Landform: Pitted outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Typical profile

Ap - 0 to 8 inches: sandy loam
E - 8 to 14 inches: loam
Bt - 14 to 19 inches: gravelly sandy loam
2BC,2C - 19 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Forage suitability group: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

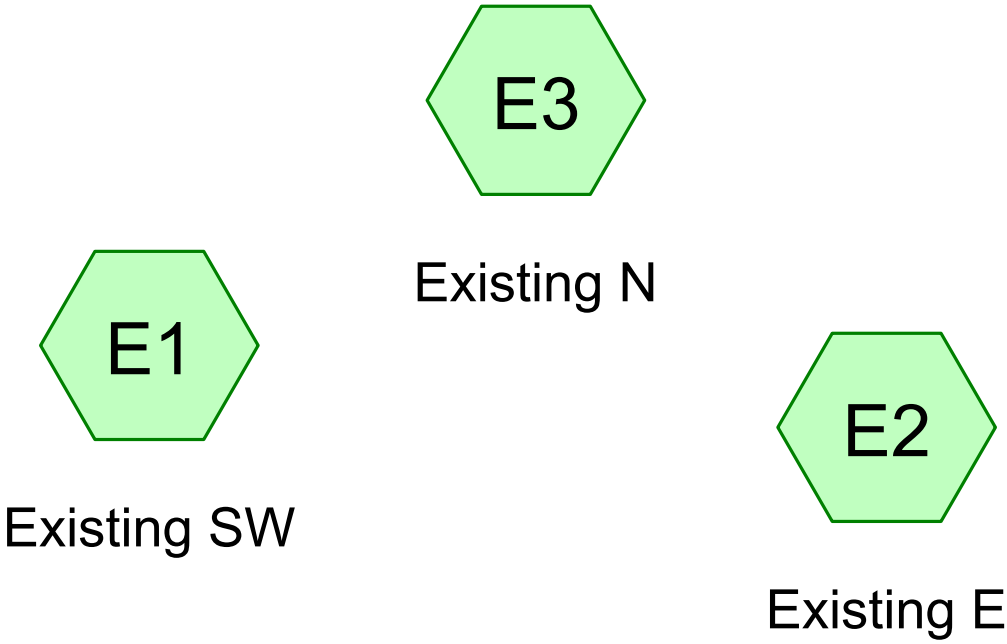
Kingsley
Percent of map unit: 5 percent
Hydric soil rating: No

Poskin
Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Ramsey County, Minnesota
Survey Area Data: Version 15, Jun 5, 2020

APPENDIX C – HydroCAD Reports



Subcat Reach Pond Link

Routing Diagram for 22163 - Model
Prepared by Sambatek, Printed 7/24/2020

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
72,925	61	>75% Grass cover, Good, HSG B (E1, E2, E3)
245	98	Paved parking, HSG A (E1, E2)
73,170	**61**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
245	HSG A	E1, E2
72,925	HSG B	E1, E2, E3
0	HSG C	
0	HSG D	
0	Other	
73,170		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing SW Runoff Area=53,791 sf 0.42% Impervious Runoff Depth=0.30"
Flow Length=295' Slope=0.0355 '/' Tc=19.7 min CN=61 Runoff=0.24 cfs 1,326 cf

Subcatchment E2: Existing E Runoff Area=14,092 sf 0.14% Impervious Runoff Depth=0.30"
Flow Length=172' Slope=0.0319 '/' Tc=13.4 min CN=61 Runoff=0.07 cfs 347 cf

Subcatchment E3: Existing N Runoff Area=5,287 sf 0.00% Impervious Runoff Depth=0.30"
Tc=10.0 min CN=61 Runoff=0.03 cfs 130 cf

Total Runoff Area = 73,170 sf Runoff Volume = 1,804 cf Average Runoff Depth = 0.30"
99.67% Pervious = 72,925 sf 0.33% Impervious = 245 sf

Summary for Subcatchment E1: Existing SW

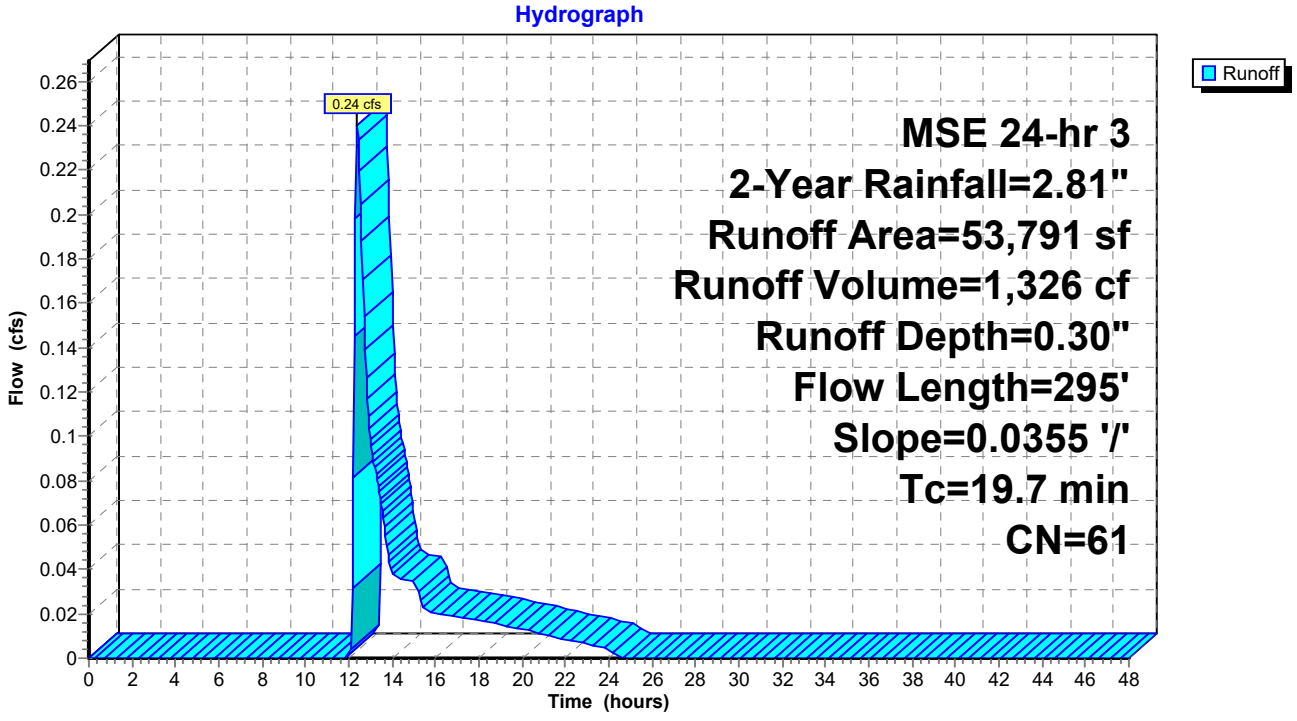
Runoff = 0.24 cfs @ 12.40 hrs, Volume= 1,326 cf, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
225	98	Paved parking, HSG A
53,566	61	>75% Grass cover, Good, HSG B
53,791	61	Weighted Average
53,566		99.58% Pervious Area
225		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	295	0.0355	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.81"

Subcatchment E1: Existing SW



Summary for Subcatchment E2: Existing E

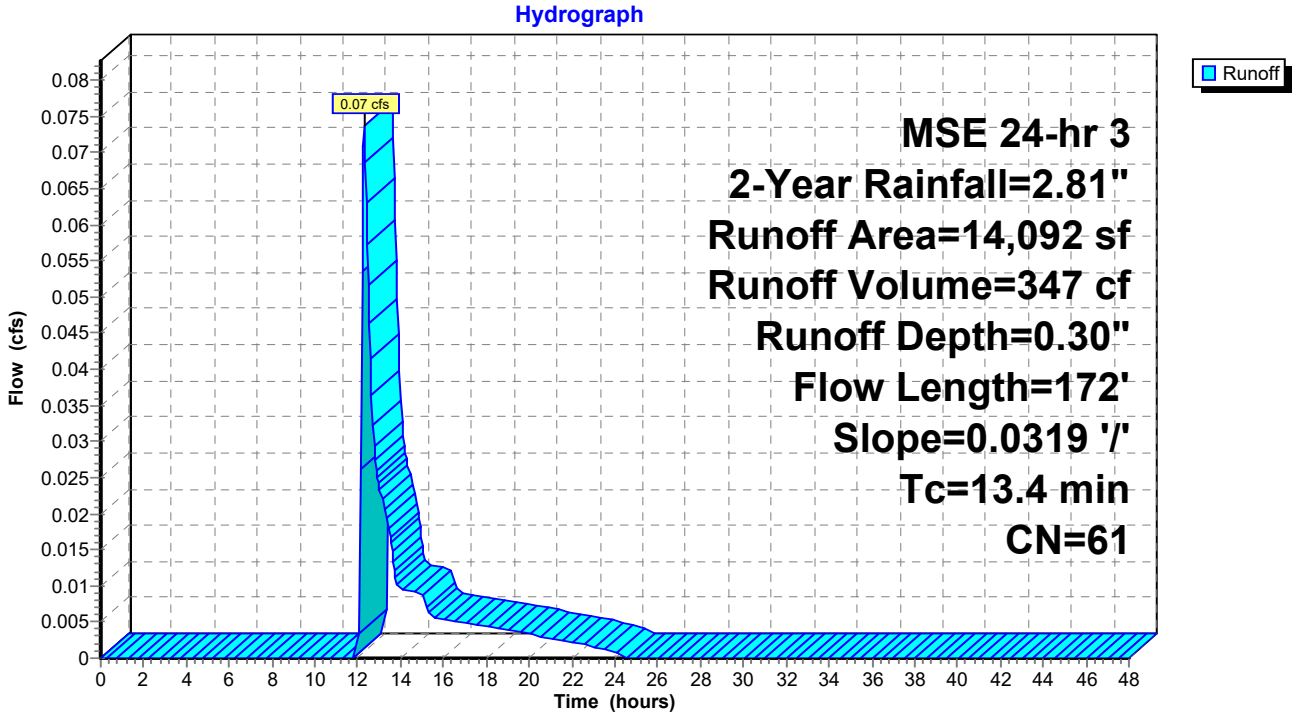
Runoff = 0.07 cfs @ 12.29 hrs, Volume= 347 cf, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
20	98	Paved parking, HSG A
14,072	61	>75% Grass cover, Good, HSG B
14,092	61	Weighted Average
14,072		99.86% Pervious Area
20		0.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	172	0.0319	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.81"

Subcatchment E2: Existing E



Summary for Subcatchment E3: Existing N

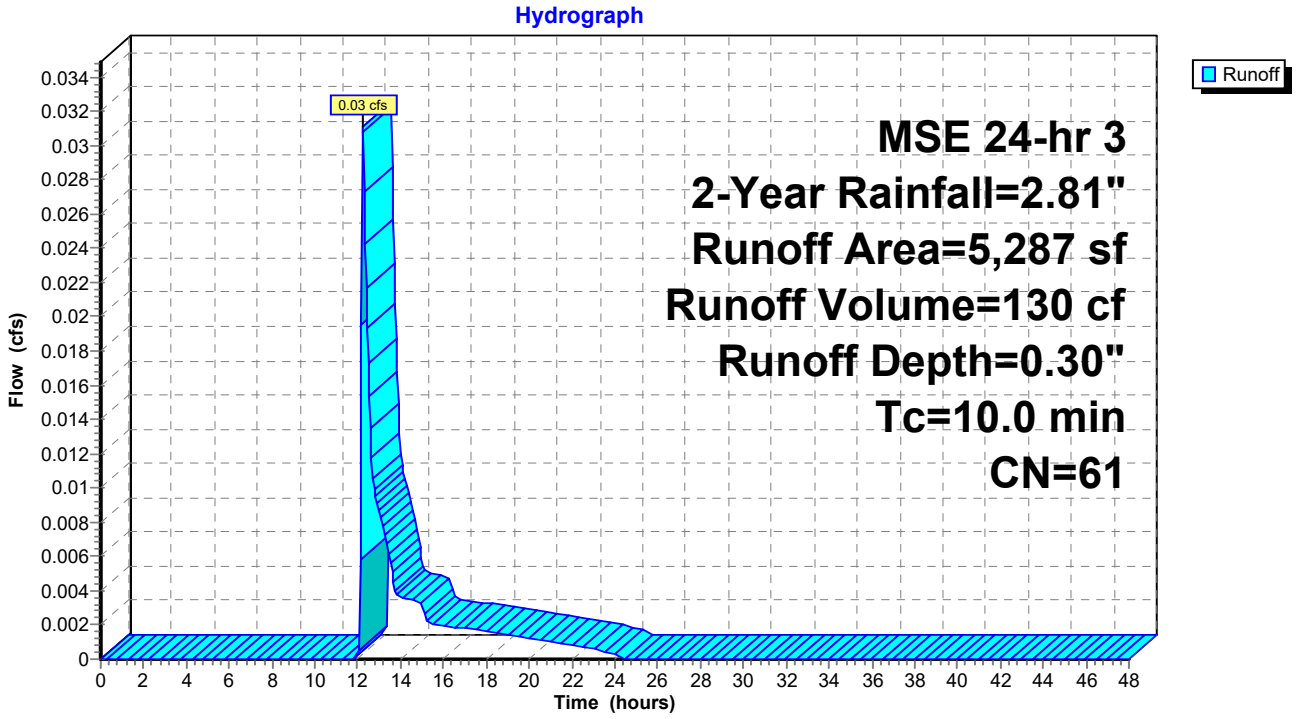
Runoff = 0.03 cfs @ 12.23 hrs, Volume= 130 cf, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
5,287	61	>75% Grass cover, Good, HSG B
5,287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment E3: Existing N



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing SW Runoff Area=53,791 sf 0.42% Impervious Runoff Depth=0.91"
Flow Length=295' Slope=0.0355 '/' Tc=19.7 min CN=61 Runoff=1.09 cfs 4,083 cf

Subcatchment E2: Existing E Runoff Area=14,092 sf 0.14% Impervious Runoff Depth=0.91"
Flow Length=172' Slope=0.0319 '/' Tc=13.4 min CN=61 Runoff=0.35 cfs 1,070 cf

Subcatchment E3: Existing N Runoff Area=5,287 sf 0.00% Impervious Runoff Depth=0.91"
Tc=10.0 min CN=61 Runoff=0.15 cfs 401 cf

Total Runoff Area = 73,170 sf Runoff Volume = 5,554 cf Average Runoff Depth = 0.91"
99.67% Pervious = 72,925 sf 0.33% Impervious = 245 sf

Summary for Subcatchment E1: Existing SW

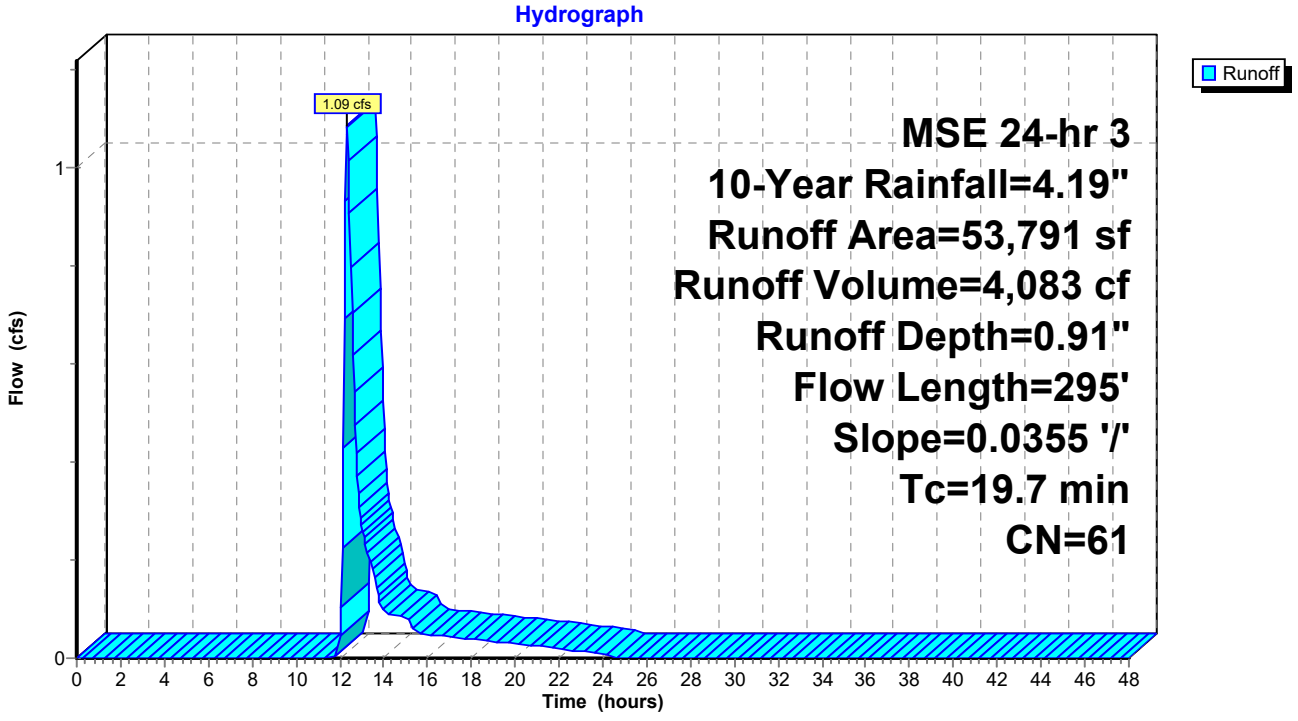
Runoff = 1.09 cfs @ 12.33 hrs, Volume= 4,083 cf, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
225	98	Paved parking, HSG A
53,566	61	>75% Grass cover, Good, HSG B
53,791	61	Weighted Average
53,566		99.58% Pervious Area
225		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	295	0.0355	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.81"

Subcatchment E1: Existing SW



Summary for Subcatchment E2: Existing E

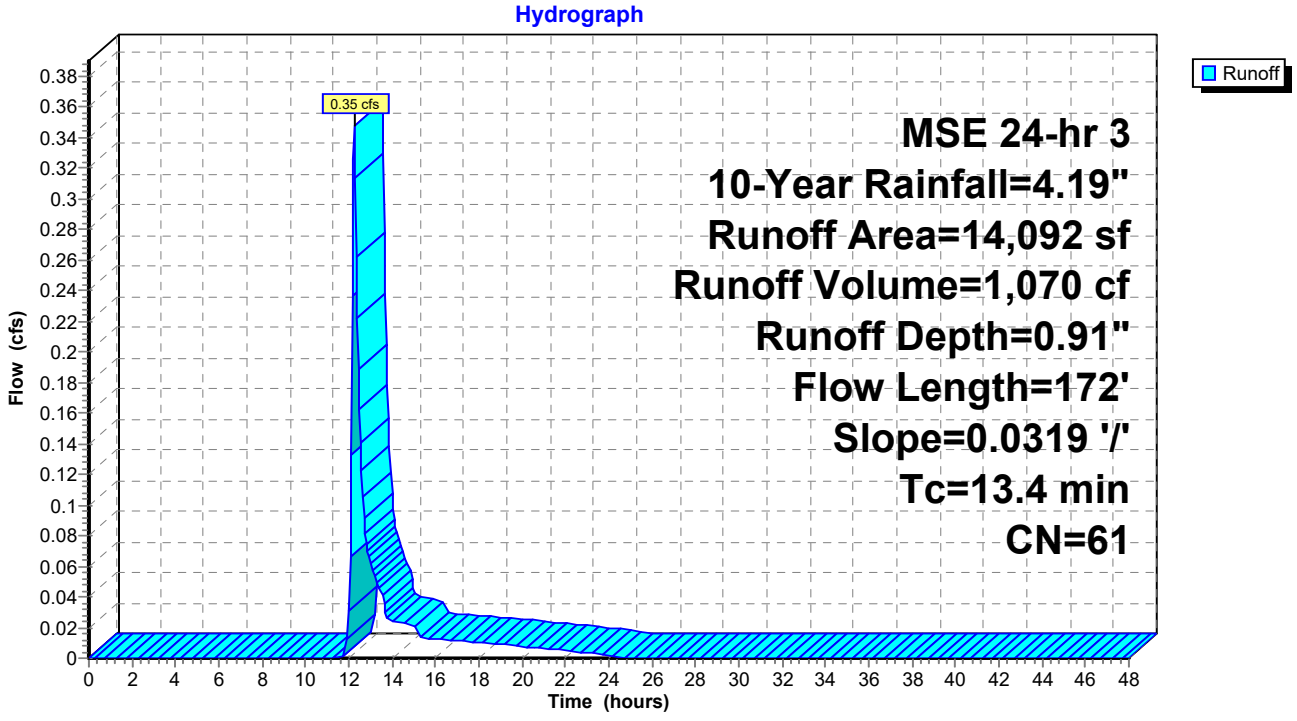
Runoff = 0.35 cfs @ 12.24 hrs, Volume= 1,070 cf, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
20	98	Paved parking, HSG A
14,072	61	>75% Grass cover, Good, HSG B
14,092	61	Weighted Average
14,072		99.86% Pervious Area
20		0.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	172	0.0319	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.81"

Subcatchment E2: Existing E



Summary for Subcatchment E3: Existing N

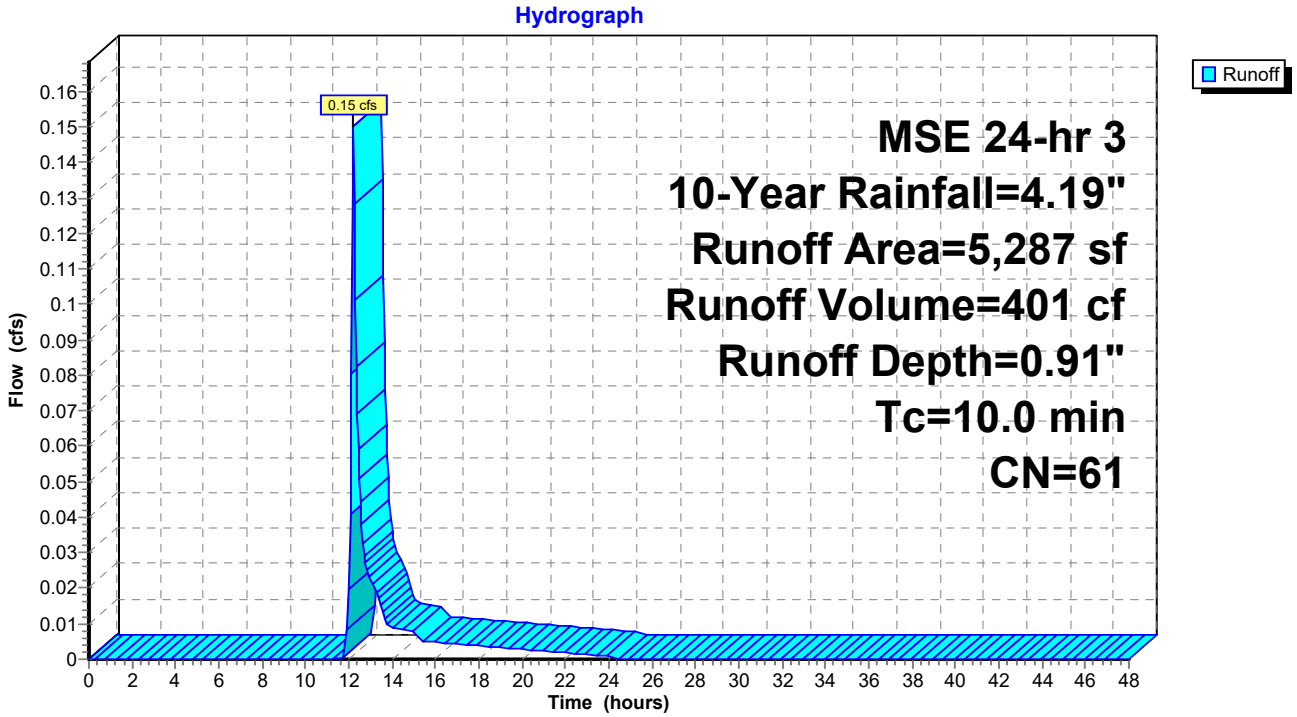
Runoff = 0.15 cfs @ 12.20 hrs, Volume= 401 cf, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
5,287	61	>75% Grass cover, Good, HSG B
5,287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment E3: Existing N



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing SW Runoff Area=53,791 sf 0.42% Impervious Runoff Depth=2.96"
Flow Length=295' Slope=0.0355 '/' Tc=19.7 min CN=61 Runoff=4.05 cfs 13,289 cf

Subcatchment E2: Existing E Runoff Area=14,092 sf 0.14% Impervious Runoff Depth=2.96"
Flow Length=172' Slope=0.0319 '/' Tc=13.4 min CN=61 Runoff=1.29 cfs 3,481 cf

Subcatchment E3: Existing N Runoff Area=5,287 sf 0.00% Impervious Runoff Depth=2.96"
Tc=10.0 min CN=61 Runoff=0.54 cfs 1,306 cf

Total Runoff Area = 73,170 sf Runoff Volume = 18,076 cf Average Runoff Depth = 2.96"
99.67% Pervious = 72,925 sf 0.33% Impervious = 245 sf

Summary for Subcatchment E1: Existing SW

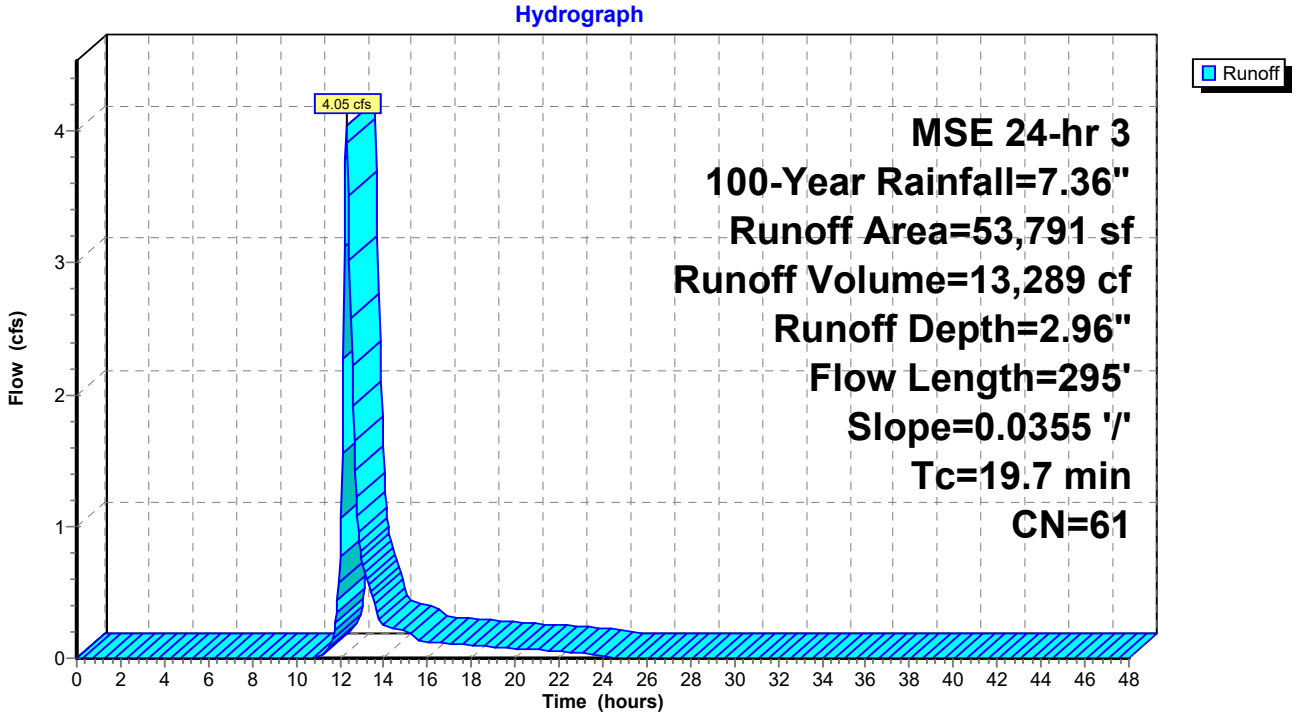
Runoff = 4.05 cfs @ 12.31 hrs, Volume= 13,289 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
225	98	Paved parking, HSG A
53,566	61	>75% Grass cover, Good, HSG B
53,791	61	Weighted Average
53,566		99.58% Pervious Area
225		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	295	0.0355	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.81"

Subcatchment E1: Existing SW



Summary for Subcatchment E2: Existing E

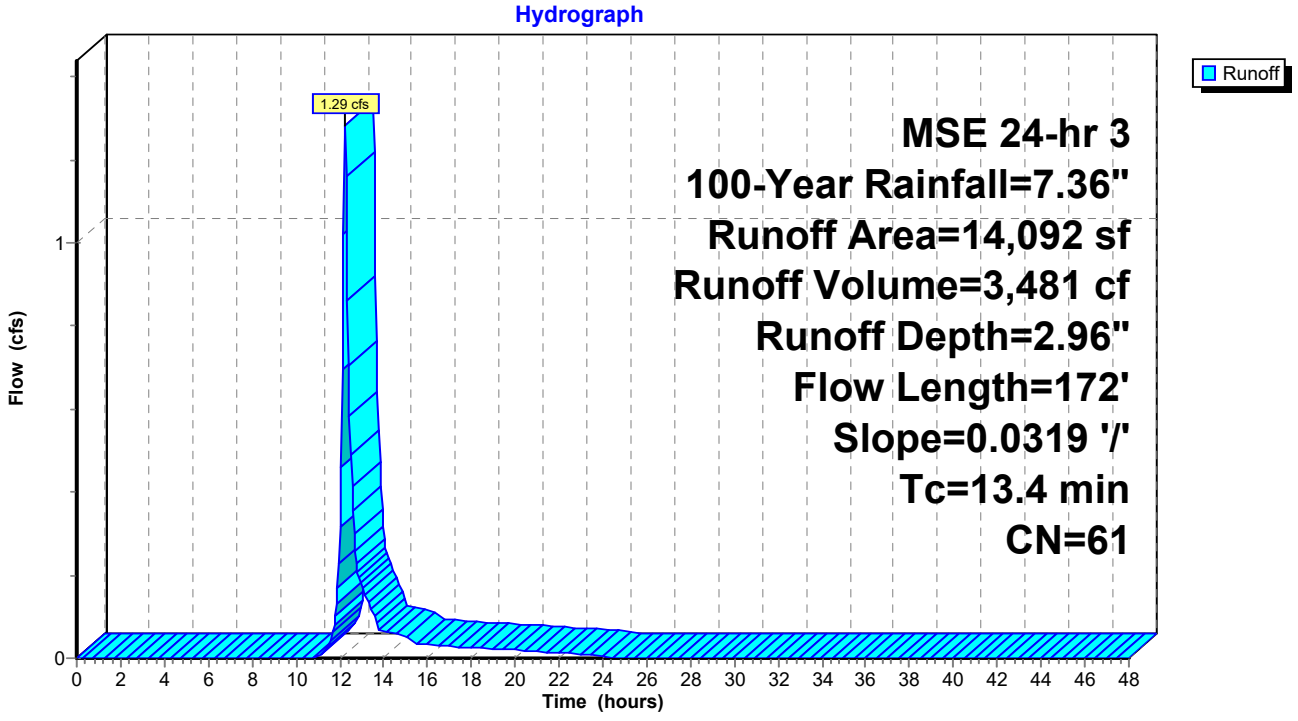
Runoff = 1.29 cfs @ 12.22 hrs, Volume= 3,481 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
20	98	Paved parking, HSG A
14,072	61	>75% Grass cover, Good, HSG B
14,092	61	Weighted Average
14,072		99.86% Pervious Area
20		0.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	172	0.0319	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.81"

Subcatchment E2: Existing E



Summary for Subcatchment E3: Existing N

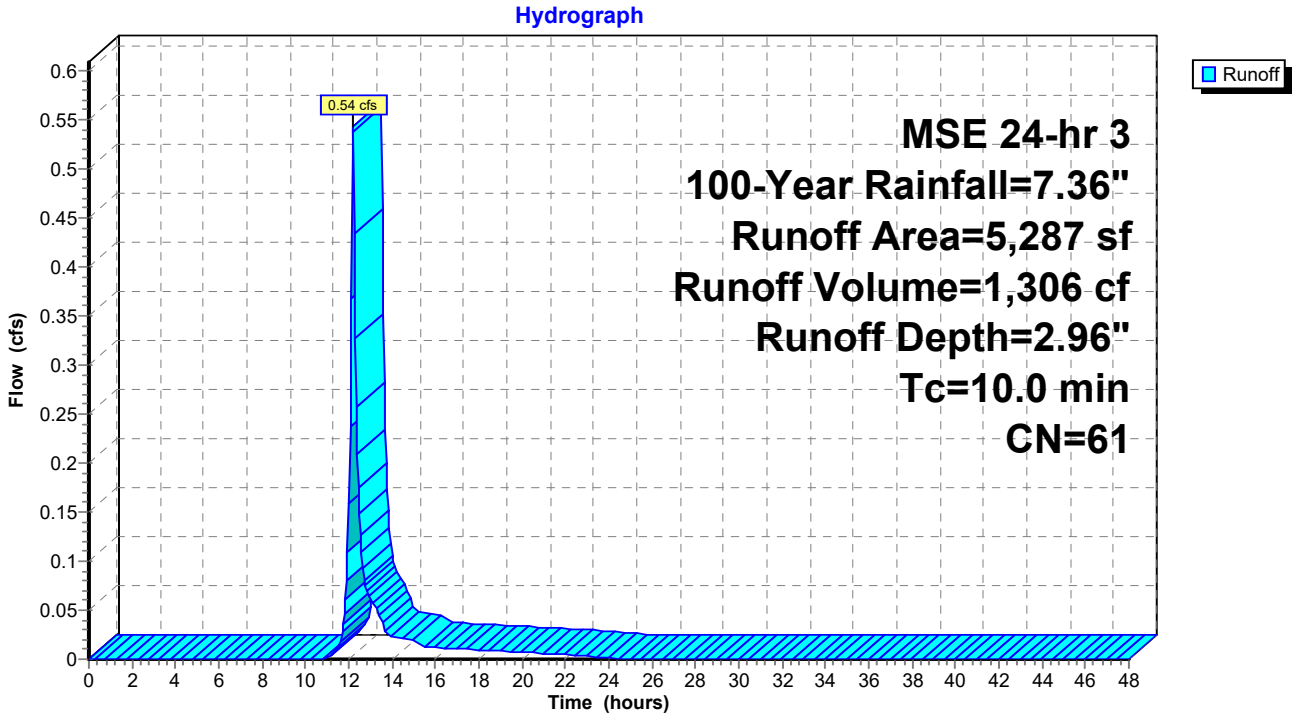
Runoff = 0.54 cfs @ 12.18 hrs, Volume= 1,306 cf, Depth= 2.96"

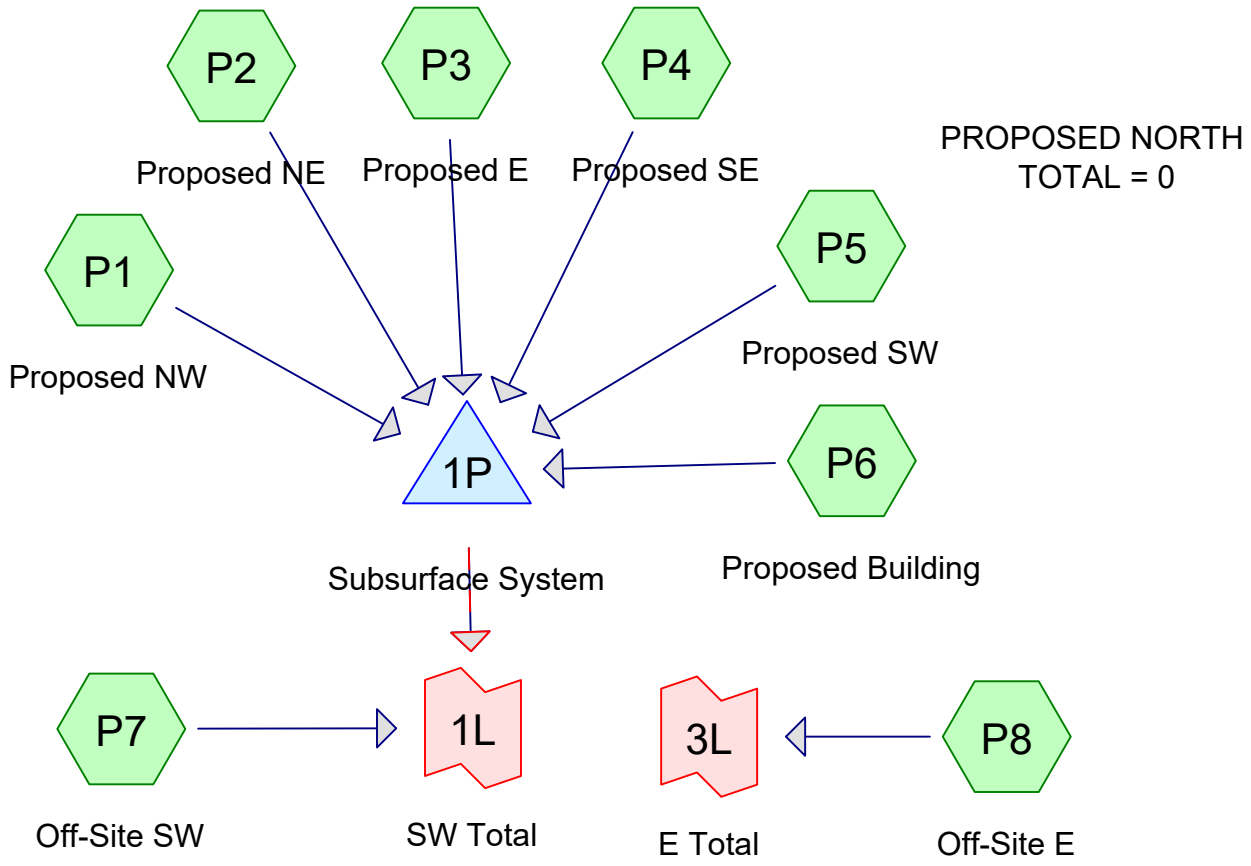
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
5,287	61	>75% Grass cover, Good, HSG B
5,287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment E3: Existing N





Proposed

Subcat Reach Pond Link

Routing Diagram for 22163 - Model
Prepared by Sambatek, Printed 7/24/2020

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,324	61	>75% Grass cover, Good, HSG B (P1, P2, P3, P4, P5, P7, P8)
60,847	98	Paved parking, HSG B (P1, P2, P3, P4, P5, P6, P7)
73,171	**92**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
73,171	HSG B	P1, P2, P3, P4, P5, P6, P7, P8
0	HSG C	
0	HSG D	
0	Other	
73,171		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Proposed NW Runoff Area=10,395 sf 83.88% Impervious Runoff Depth=1.98"
Tc=7.0 min CN=92 Runoff=0.79 cfs 1,717 cf

Subcatchment P2: Proposed NE Runoff Area=12,683 sf 83.43% Impervious Runoff Depth=1.98"
Tc=7.0 min CN=92 Runoff=0.97 cfs 2,095 cf

Subcatchment P3: Proposed E Runoff Area=6,835 sf 89.69% Impervious Runoff Depth=2.17"
Tc=7.0 min CN=94 Runoff=0.56 cfs 1,234 cf

Subcatchment P4: Proposed SE Runoff Area=13,536 sf 82.93% Impervious Runoff Depth=1.98"
Tc=7.0 min CN=92 Runoff=1.03 cfs 2,236 cf

Subcatchment P5: Proposed SW Runoff Area=9,341 sf 96.58% Impervious Runoff Depth=2.47"
Tc=7.0 min CN=97 Runoff=0.82 cfs 1,923 cf

Subcatchment P6: Proposed Building Runoff Area=12,654 sf 100.00% Impervious Runoff Depth=2.58"
Tc=10.0 min CN=98 Runoff=1.01 cfs 2,720 cf

Subcatchment P7: Off-Site SW Runoff Area=6,455 sf 38.96% Impervious Runoff Depth=0.84"
Tc=7.0 min CN=75 Runoff=0.21 cfs 451 cf

Subcatchment P8: Off-Site E Runoff Area=1,272 sf 0.00% Impervious Runoff Depth=0.30"
Tc=7.0 min CN=61 Runoff=0.01 cfs 31 cf

Pond 1P: Subsurface System Peak Elev=921.25' Storage=7,793 cf Inflow=5.14 cfs 11,925 cf
Discarded=0.07 cfs 10,416 cf Primary=0.20 cfs 1,493 cf Secondary=0.00 cfs 0 cf Outflow=0.28 cfs 11,909 cf

Link 1L: SW Total Inflow=0.22 cfs 1,944 cf
Primary=0.22 cfs 1,944 cf

Link 3L: E Total Inflow=0.01 cfs 31 cf
Primary=0.01 cfs 31 cf

Total Runoff Area = 73,171 sf Runoff Volume = 12,407 cf Average Runoff Depth = 2.03"
16.84% Pervious = 12,324 sf 83.16% Impervious = 60,847 sf

Summary for Subcatchment P1: Proposed NW

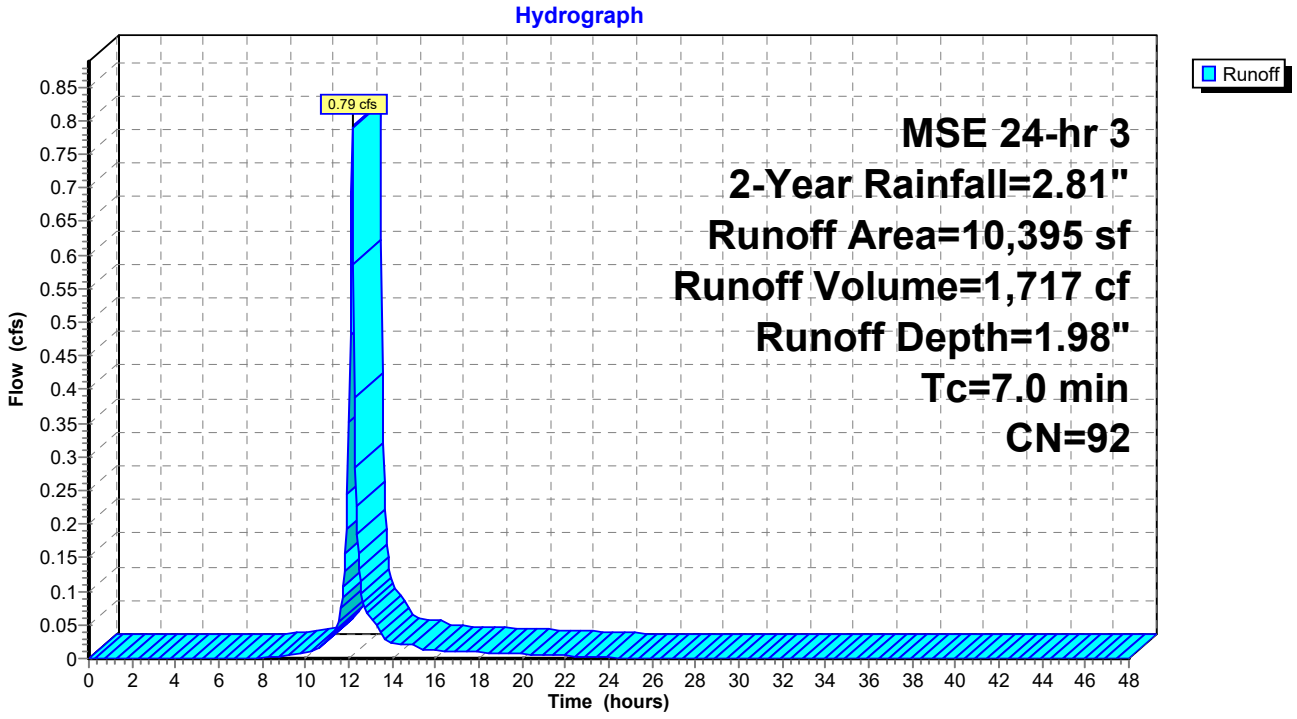
Runoff = 0.79 cfs @ 12.14 hrs, Volume= 1,717 cf, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
1,676	61	>75% Grass cover, Good, HSG B
8,719	98	Paved parking, HSG B
10,395	92	Weighted Average
1,676		16.12% Pervious Area
8,719		83.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P1: Proposed NW



Summary for Subcatchment P2: Proposed NE

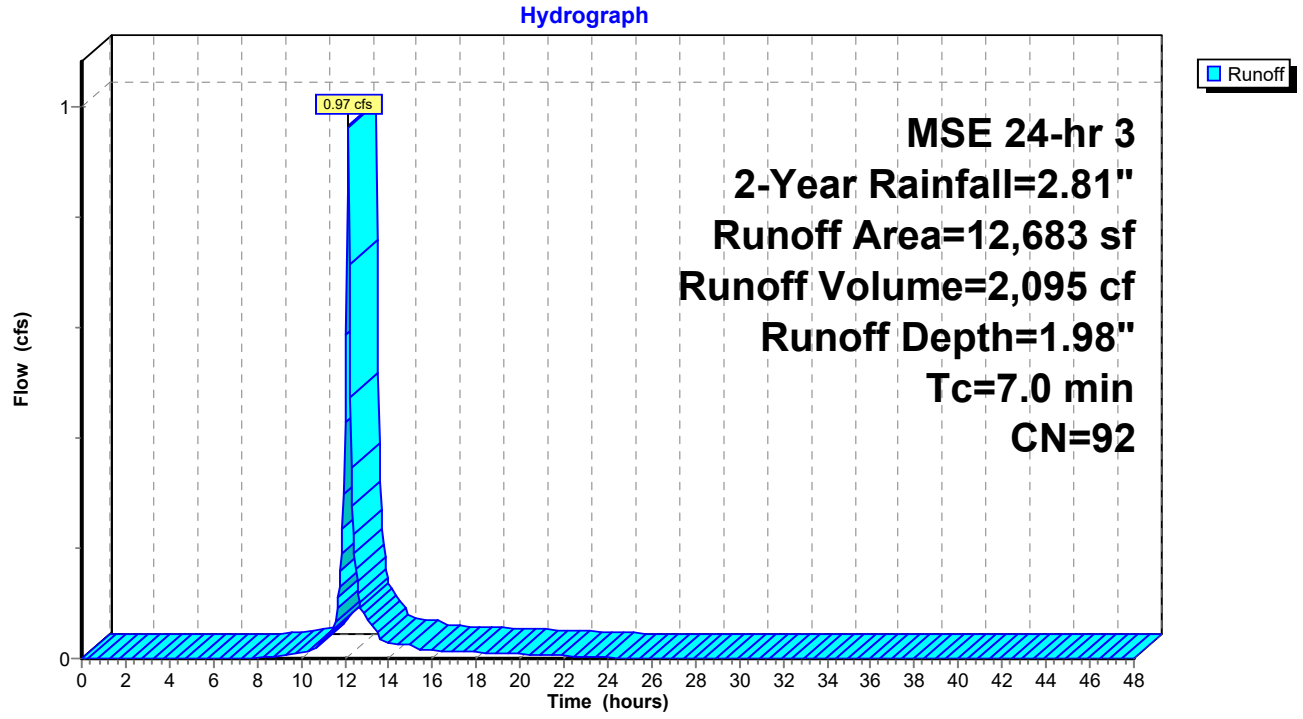
Runoff = 0.97 cfs @ 12.14 hrs, Volume= 2,095 cf, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
2,102	61	>75% Grass cover, Good, HSG B
10,581	98	Paved parking, HSG B
12,683	92	Weighted Average
2,102		16.57% Pervious Area
10,581		83.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P2: Proposed NE



Summary for Subcatchment P3: Proposed E

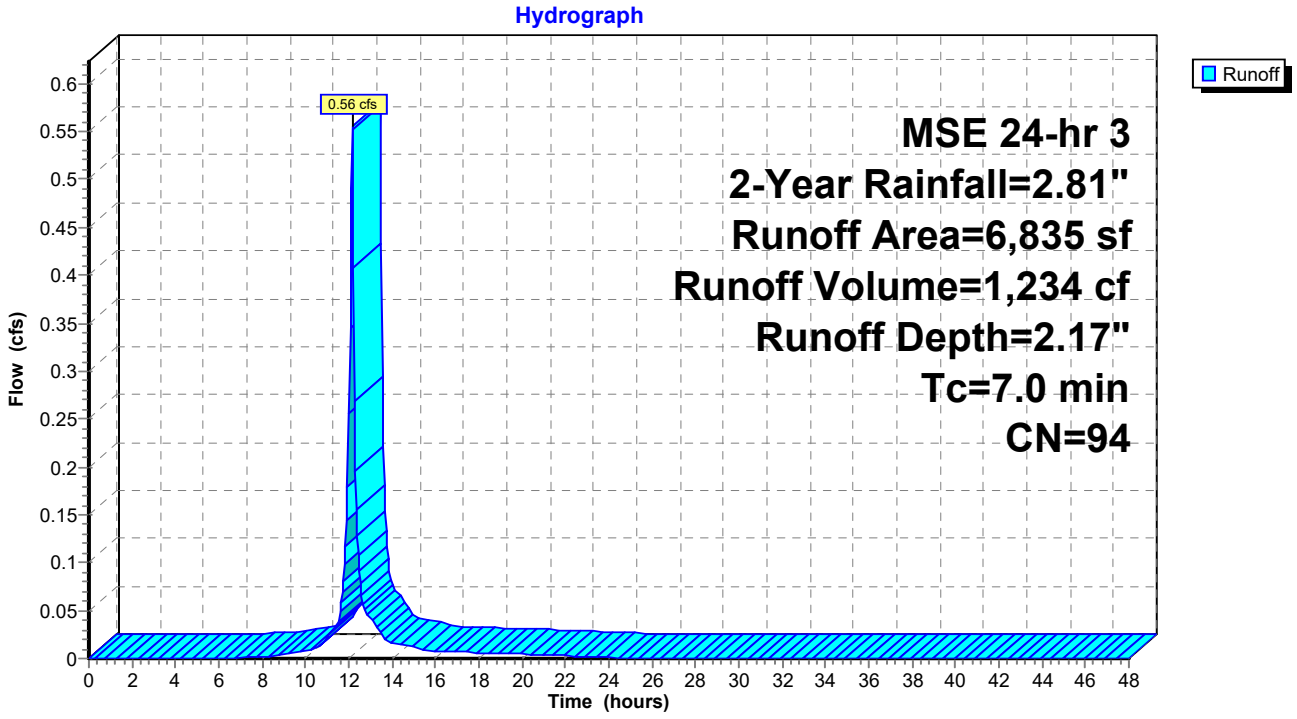
Runoff = 0.56 cfs @ 12.14 hrs, Volume= 1,234 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
705	61	>75% Grass cover, Good, HSG B
6,130	98	Paved parking, HSG B
6,835	94	Weighted Average
705		10.31% Pervious Area
6,130		89.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P3: Proposed E



Summary for Subcatchment P4: Proposed SE

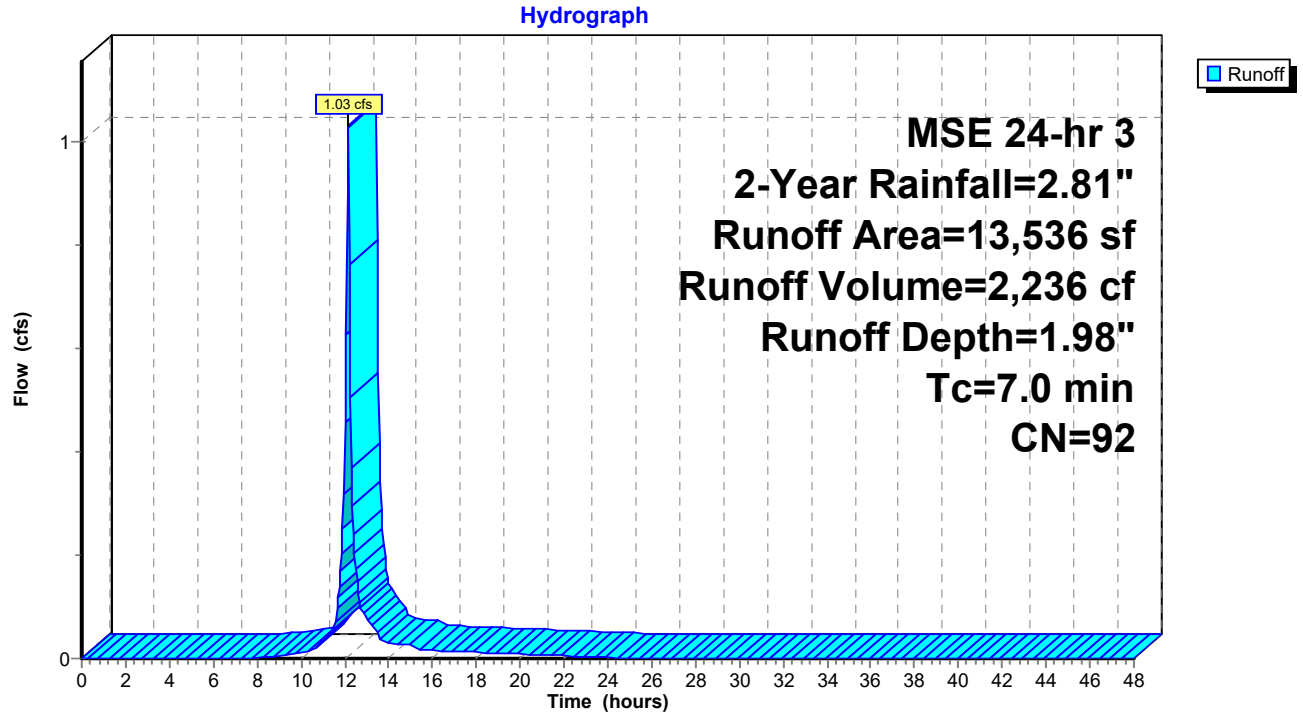
Runoff = 1.03 cfs @ 12.14 hrs, Volume= 2,236 cf, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
2,310	61	>75% Grass cover, Good, HSG B
11,226	98	Paved parking, HSG B
13,536	92	Weighted Average
2,310		17.07% Pervious Area
11,226		82.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P4: Proposed SE



Summary for Subcatchment P5: Proposed SW

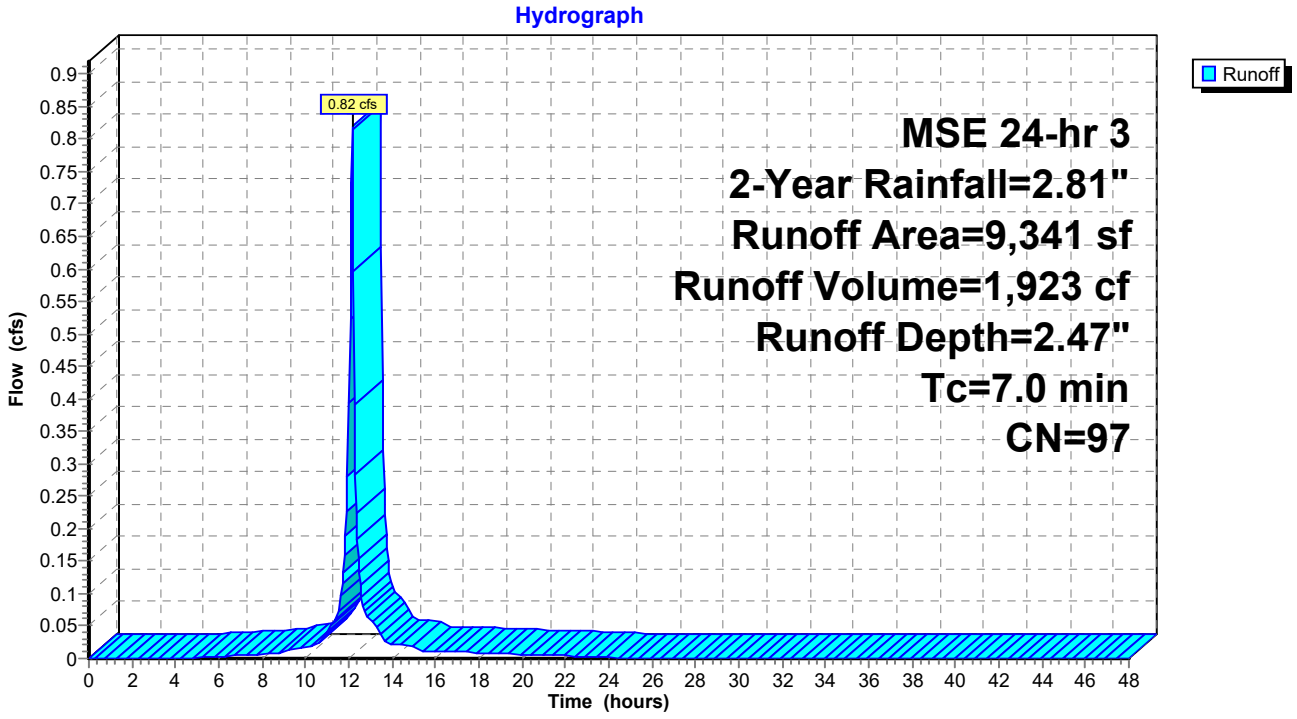
Runoff = 0.82 cfs @ 12.14 hrs, Volume= 1,923 cf, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
319	61	>75% Grass cover, Good, HSG B
9,022	98	Paved parking, HSG B
9,341	97	Weighted Average
319		3.42% Pervious Area
9,022		96.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P5: Proposed SW



Summary for Subcatchment P6: Proposed Building

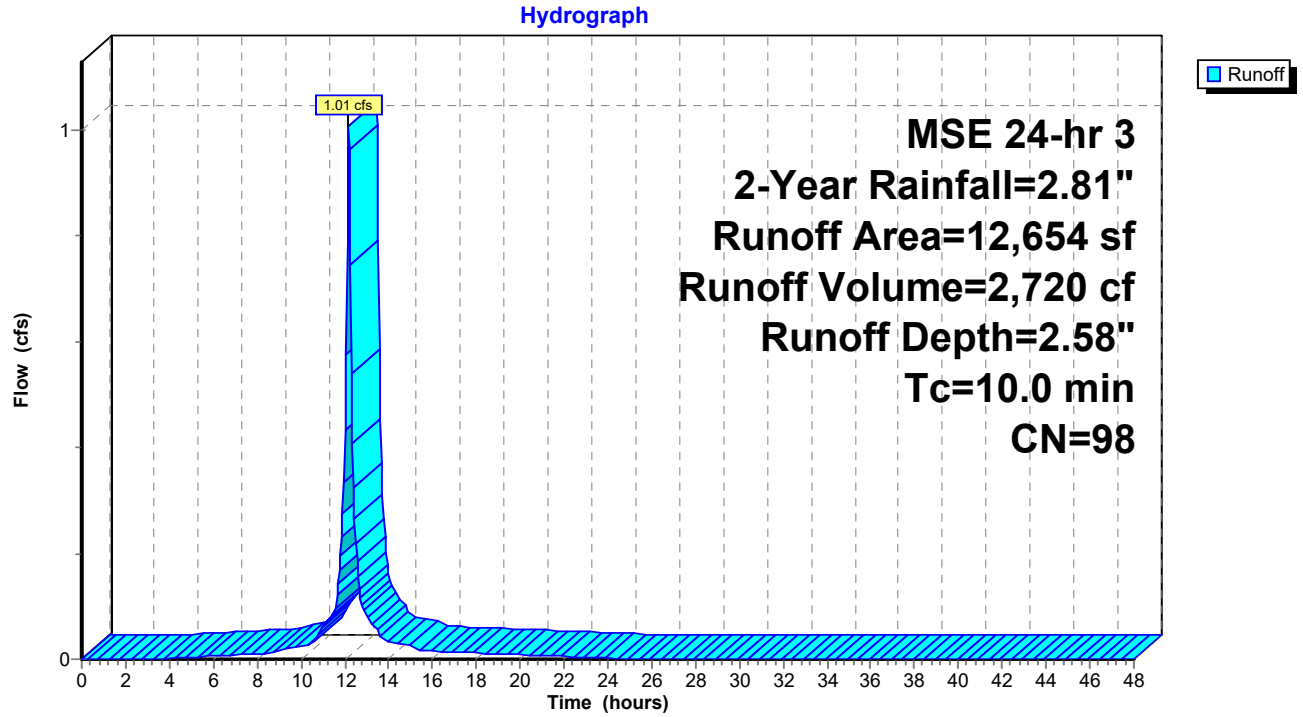
Runoff = 1.01 cfs @ 12.17 hrs, Volume= 2,720 cf, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
12,654	98	Paved parking, HSG B
12,654		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P6: Proposed Building



Summary for Subcatchment P7: Off-Site SW

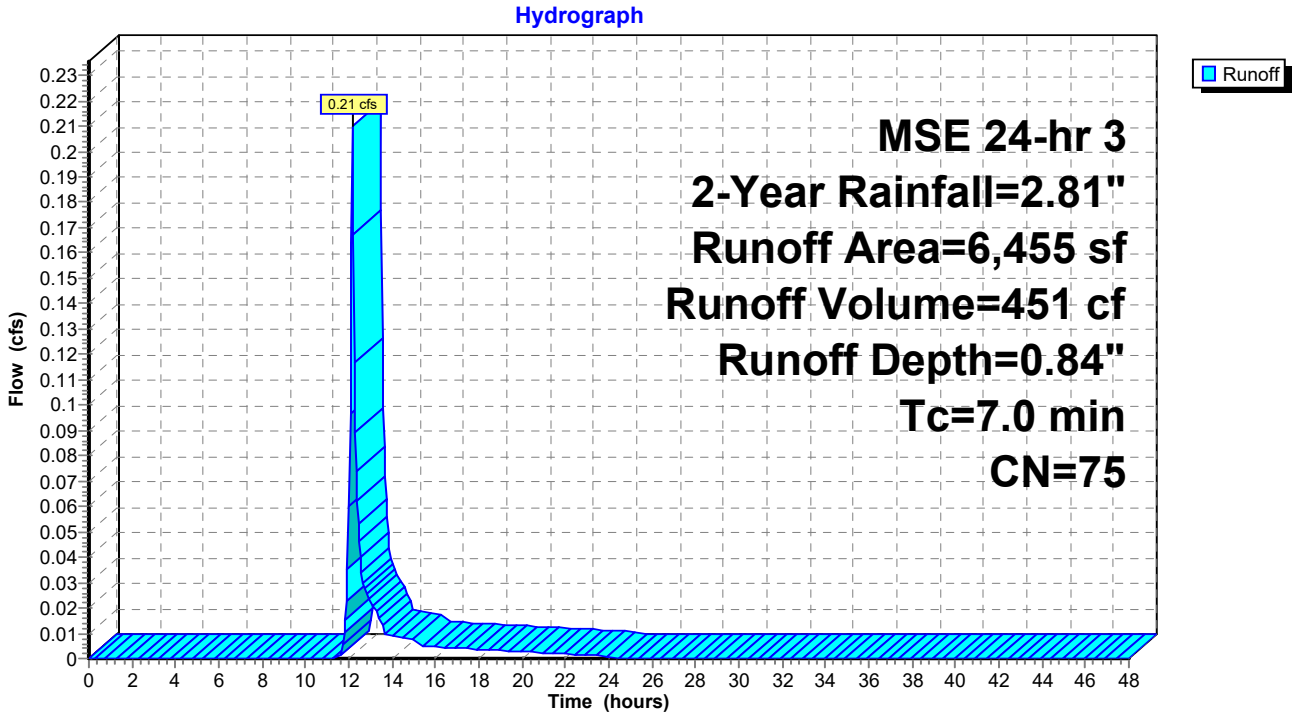
Runoff = 0.21 cfs @ 12.15 hrs, Volume= 451 cf, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
3,940	61	>75% Grass cover, Good, HSG B
2,515	98	Paved parking, HSG B
6,455	75	Weighted Average
3,940		61.04% Pervious Area
2,515		38.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P7: Off-Site SW



Summary for Subcatchment P8: Off-Site E

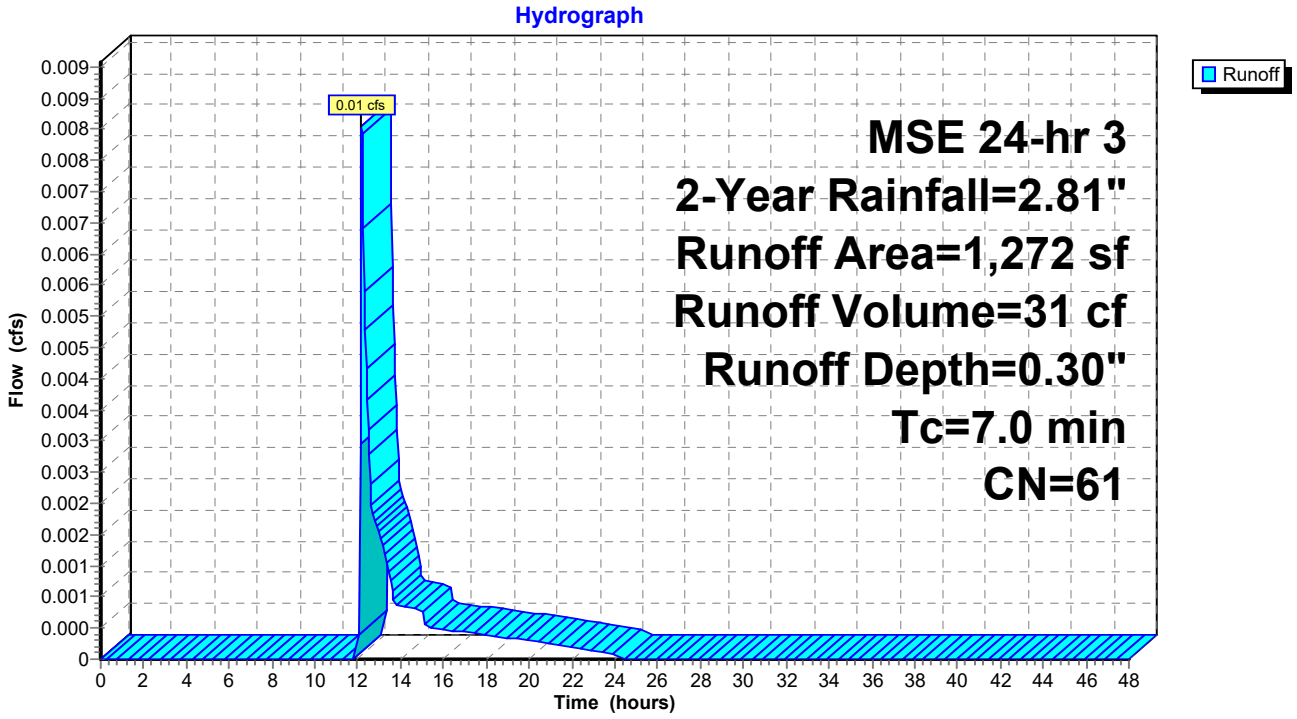
Runoff = 0.01 cfs @ 12.18 hrs, Volume= 31 cf, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.81"

Area (sf)	CN	Description
1,272	61	>75% Grass cover, Good, HSG B
1,272		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P8: Off-Site E



Summary for Pond 1P: Subsurface System

Inflow Area = 65,444 sf, 89.13% Impervious, Inflow Depth = 2.19" for 2-Year event
Inflow = 5.14 cfs @ 12.14 hrs, Volume= 11,925 cf
Outflow = 0.28 cfs @ 13.42 hrs, Volume= 11,909 cf, Atten= 95%, Lag= 76.8 min
Discarded = 0.07 cfs @ 10.40 hrs, Volume= 10,416 cf
Primary = 0.20 cfs @ 13.42 hrs, Volume= 1,493 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 921.25' @ 13.42 hrs Surf.Area= 4,032 sf Storage= 7,793 cf

Plug-Flow detention time= 800.5 min calculated for 11,896 cf (100% of inflow)
Center-of-Mass det. time= 800.3 min (1,575.8 - 775.5)

Volume	Invert	Avail.Storage	Storage Description
#1	925.25'	2,074 cf	**Low Inlet Overflow (Prismatic)** Listed below (Recalc)
#2A	918.50'	5,655 cf	**29.92'W x 134.76'L x 5.50'H Field A** 22,174 cf Overall - 8,036 cf Embedded = 14,138 cf x 40.0% Voids
#3A	919.25'	8,036 cf	**ADS_StormTech MC-3500 d +Cap** x 72 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 4 Rows of 18 Chambers Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf
		15,765 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
925.25	13	0	0
926.00	650	249	249
927.00	3,000	1,825	2,074

Device	Routing	Invert	Outlet Devices
#1	Primary	921.00'	**15.0" Round Culvert** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 921.00' / 920.96' S= 0.0040 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Discarded	918.50'	**0.800 in/hr Exfiltration over Surface area**
#3	Secondary	925.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.07 cfs @ 10.40 hrs HW=918.59' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.20 cfs @ 13.42 hrs HW=921.25' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.20 cfs @ 1.69 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=918.50' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 1P: Subsurface System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

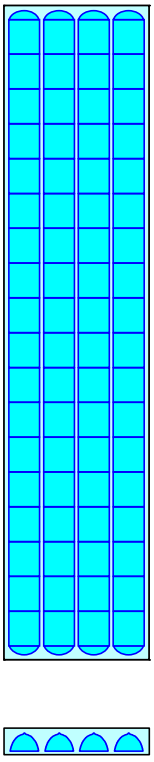
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

72 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 8,035.7 cf Chamber Storage

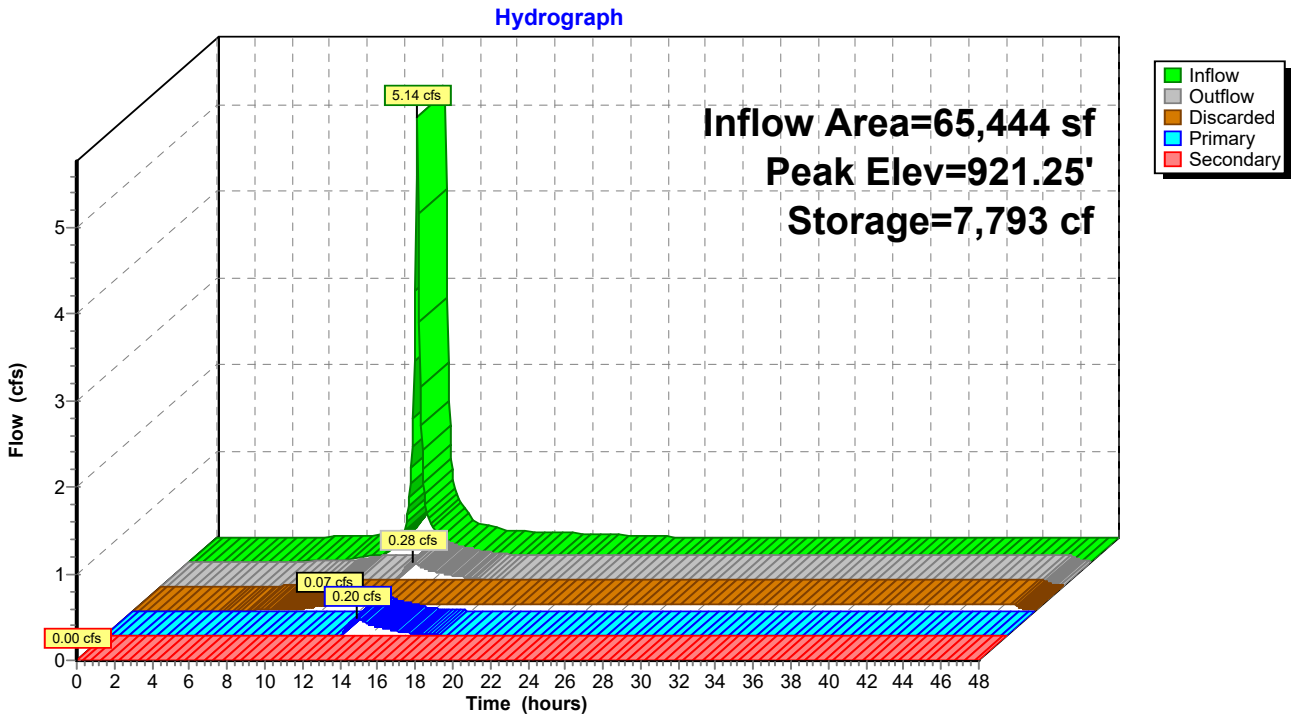
22,173.6 cf Field - 8,035.7 cf Chambers = 14,137.9 cf Stone x 40.0% Voids = 5,655.2 cf Stone Storage

Chamber Storage + Stone Storage = 13,690.9 cf = 0.314 af
Overall Storage Efficiency = 61.7%
Overall System Size = 134.76' x 29.92' x 5.50'

72 Chambers
821.2 cy Field
523.6 cy Stone



Pond 1P: Subsurface System



Stage-Area-Storage for Pond 1P: Subsurface System

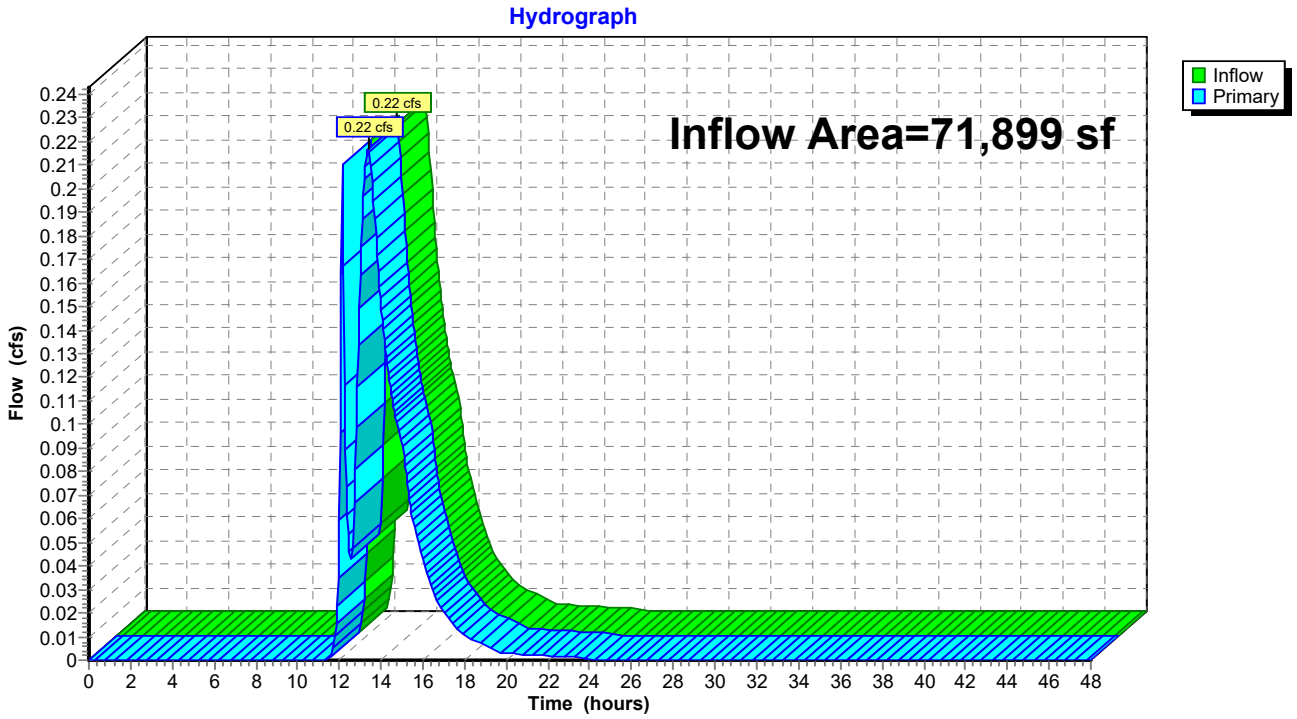
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
918.50	4,032	0
918.60	4,032	161
918.70	4,032	323
918.80	4,032	484
918.90	4,032	645
919.00	4,032	806
919.10	4,032	968
919.20	4,032	1,129
919.30	4,032	1,382
919.40	4,032	1,727
919.50	4,032	2,070
919.60	4,032	2,412
919.70	4,032	2,753
919.80	4,032	3,092
919.90	4,032	3,430
920.00	4,032	3,766
920.10	4,032	4,100
920.20	4,032	4,433
920.30	4,032	4,763
920.40	4,032	5,092
920.50	4,032	5,418
920.60	4,032	5,742
920.70	4,032	6,063
920.80	4,032	6,382
920.90	4,032	6,698
921.00	4,032	7,010
921.10	4,032	7,320
921.20	4,032	7,626
921.30	4,032	7,929
921.40	4,032	8,228
921.50	4,032	8,523
921.60	4,032	8,813
921.70	4,032	9,098
921.80	4,032	9,379
921.90	4,032	9,654
922.00	4,032	9,923
922.10	4,032	10,186
922.20	4,032	10,441
922.30	4,032	10,689
922.40	4,032	10,927
922.50	4,032	11,154
922.60	4,032	11,366
922.70	4,032	11,560
922.80	4,032	11,740
922.90	4,032	11,913
923.00	4,032	12,078
923.10	4,032	12,240
923.20	4,032	12,401
923.30	4,032	12,562
923.40	4,032	12,723
923.50	4,032	12,885
923.60	4,032	13,046
923.70	4,032	13,207
923.80	4,032	13,368
923.90	4,032	13,530
924.00	4,032	13,691
924.10	4,032	13,691
924.20	4,032	13,691
924.30	4,032	13,691
924.40	4,032	13,691
924.50	4,032	13,691
924.60	4,032	13,691
924.70	4,032	13,691
924.80	4,032	13,691
924.90	4,032	13,691
925.00	4,032	13,691
925.10	4,032	13,691
925.20	4,032	13,691
925.30	4,087	13,693
925.40	4,172	13,702
925.50	4,257	13,721
925.60	4,342	13,747
925.70	4,427	13,783
925.80	4,512	13,827
925.90	4,597	13,879
926.00	4,682	13,940
926.10	4,917	14,016
926.20	5,152	14,117
926.30	5,387	14,240
926.40	5,622	14,388
926.50	5,857	14,558
926.60	6,092	14,753
926.70	6,327	14,970
926.80	6,562	15,212
926.90	6,797	15,476
927.00	**7,032**	**15,765**

Summary for Link 1L: SW Total

Inflow Area = 71,899 sf, 84.63% Impervious, Inflow Depth = 0.32" for 2-Year event
Inflow = 0.22 cfs @ 13.40 hrs, Volume= 1,944 cf
Primary = 0.22 cfs @ 13.40 hrs, Volume= 1,944 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1L: SW Total

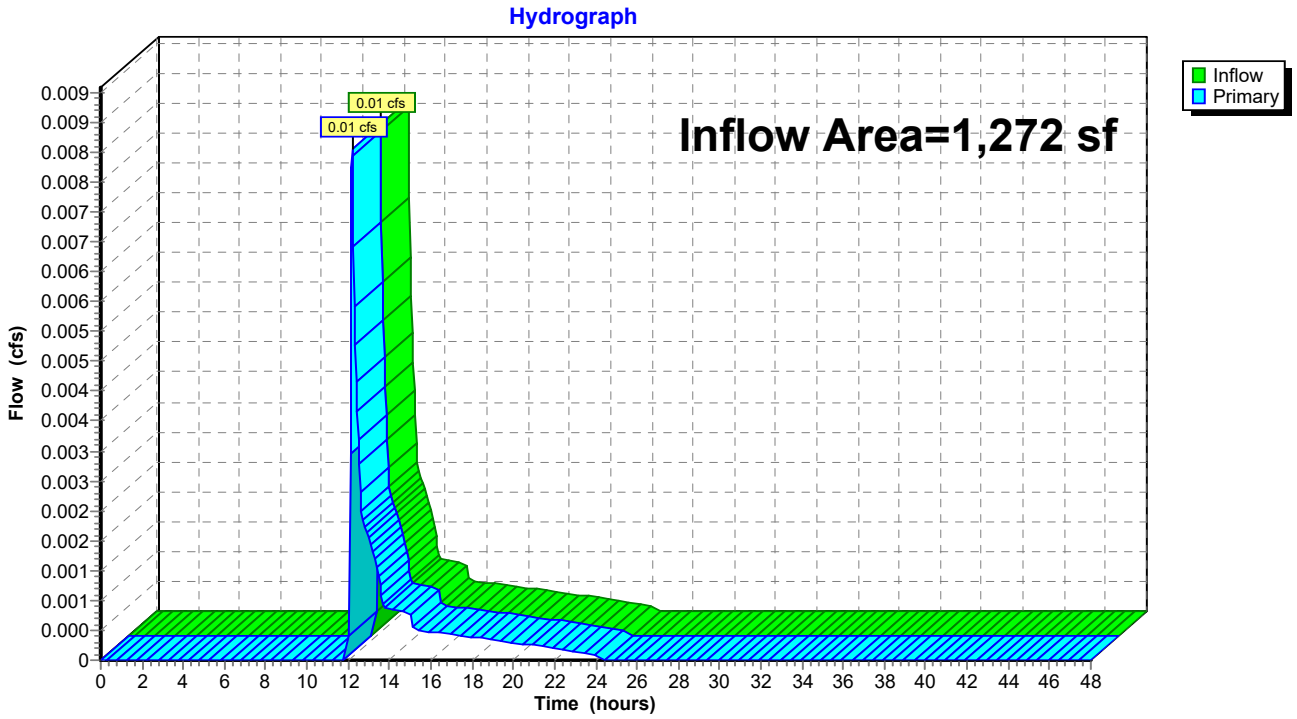


Summary for Link 3L: E Total

Inflow Area = 1,272 sf, 0.00% Impervious, Inflow Depth = 0.30" for 2-Year event
Inflow = 0.01 cfs @ 12.18 hrs, Volume= 31 cf
Primary = 0.01 cfs @ 12.18 hrs, Volume= 31 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 3L: E Total



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Proposed NW Runoff Area=10,395 sf 83.88% Impervious Runoff Depth=3.30"
Tc=7.0 min CN=92 Runoff=1.28 cfs 2,860 cf

Subcatchment P2: Proposed NE Runoff Area=12,683 sf 83.43% Impervious Runoff Depth=3.30"
Tc=7.0 min CN=92 Runoff=1.56 cfs 3,489 cf

Subcatchment P3: Proposed E Runoff Area=6,835 sf 89.69% Impervious Runoff Depth=3.51"
Tc=7.0 min CN=94 Runoff=0.87 cfs 2,000 cf

Subcatchment P4: Proposed SE Runoff Area=13,536 sf 82.93% Impervious Runoff Depth=3.30"
Tc=7.0 min CN=92 Runoff=1.67 cfs 3,724 cf

Subcatchment P5: Proposed SW Runoff Area=9,341 sf 96.58% Impervious Runoff Depth=3.84"
Tc=7.0 min CN=97 Runoff=1.25 cfs 2,989 cf

Subcatchment P6: Proposed Building Runoff Area=12,654 sf 100.00% Impervious Runoff Depth=3.95"
Tc=10.0 min CN=98 Runoff=1.51 cfs 4,170 cf

Subcatchment P7: Off-Site SW Runoff Area=6,455 sf 38.96% Impervious Runoff Depth=1.81"
Tc=7.0 min CN=75 Runoff=0.47 cfs 974 cf

Subcatchment P8: Off-Site E Runoff Area=1,272 sf 0.00% Impervious Runoff Depth=0.91"
Tc=7.0 min CN=61 Runoff=0.04 cfs 97 cf

Pond 1P: Subsurface System Peak Elev=921.93' Storage=9,739 cf Inflow=8.09 cfs 19,232 cf
Discarded=0.07 cfs 10,999 cf Primary=2.26 cfs 7,988 cf Secondary=0.00 cfs 0 cf Outflow=2.33 cfs 18,987 cf

Link 1L: SW Total Inflow=2.40 cfs 8,962 cf
Primary=2.40 cfs 8,962 cf

Link 3L: E Total Inflow=0.04 cfs 97 cf
Primary=0.04 cfs 97 cf

Total Runoff Area = 73,171 sf Runoff Volume = 20,303 cf Average Runoff Depth = 3.33"
16.84% Pervious = 12,324 sf 83.16% Impervious = 60,847 sf

Summary for Subcatchment P1: Proposed NW

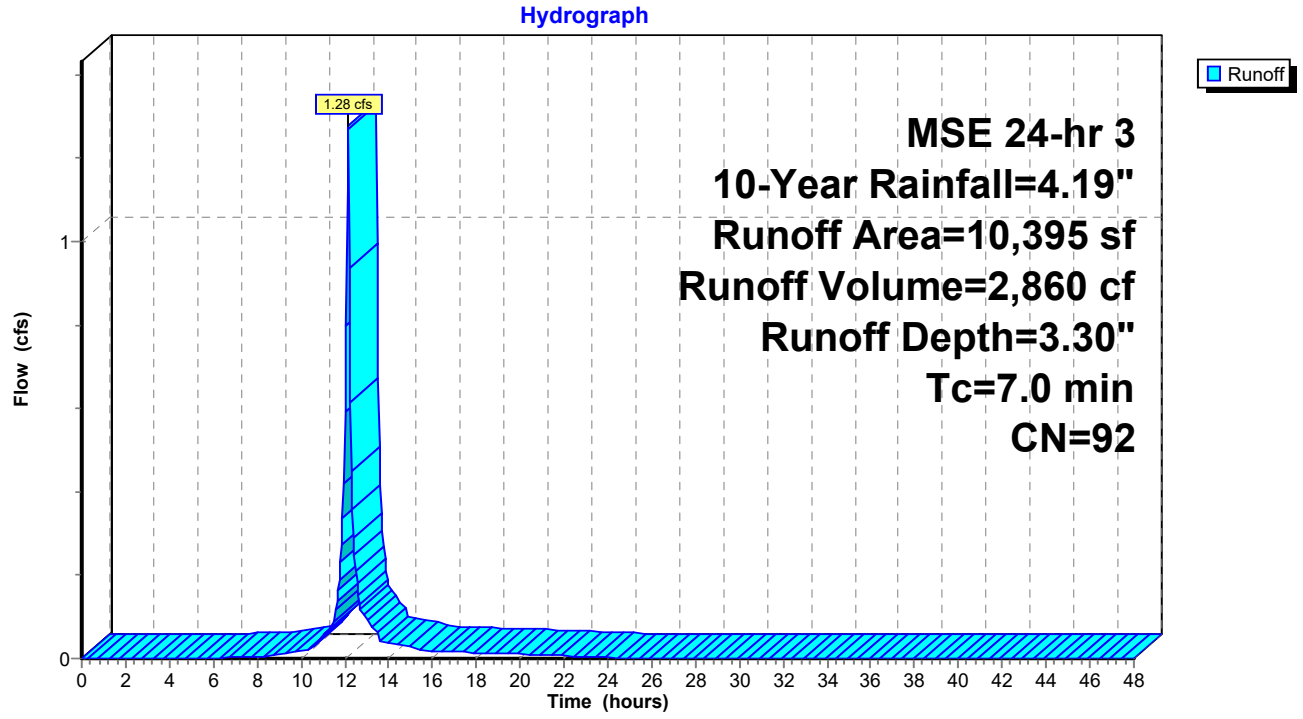
Runoff = 1.28 cfs @ 12.14 hrs, Volume= 2,860 cf, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
1,676	61	>75% Grass cover, Good, HSG B
8,719	98	Paved parking, HSG B
10,395	92	Weighted Average
1,676		16.12% Pervious Area
8,719		83.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P1: Proposed NW



Summary for Subcatchment P2: Proposed NE

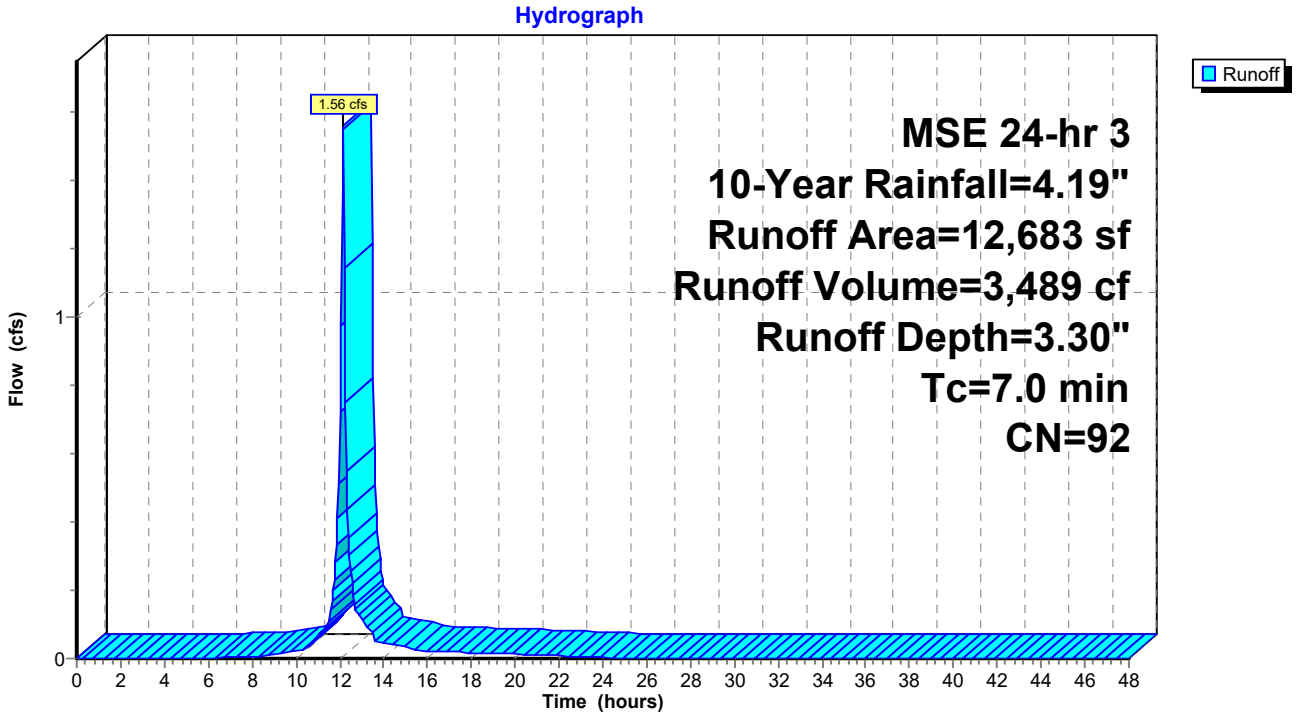
Runoff = 1.56 cfs @ 12.14 hrs, Volume= 3,489 cf, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
2,102	61	>75% Grass cover, Good, HSG B
10,581	98	Paved parking, HSG B
12,683	92	Weighted Average
2,102		16.57% Pervious Area
10,581		83.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P2: Proposed NE



Summary for Subcatchment P3: Proposed E

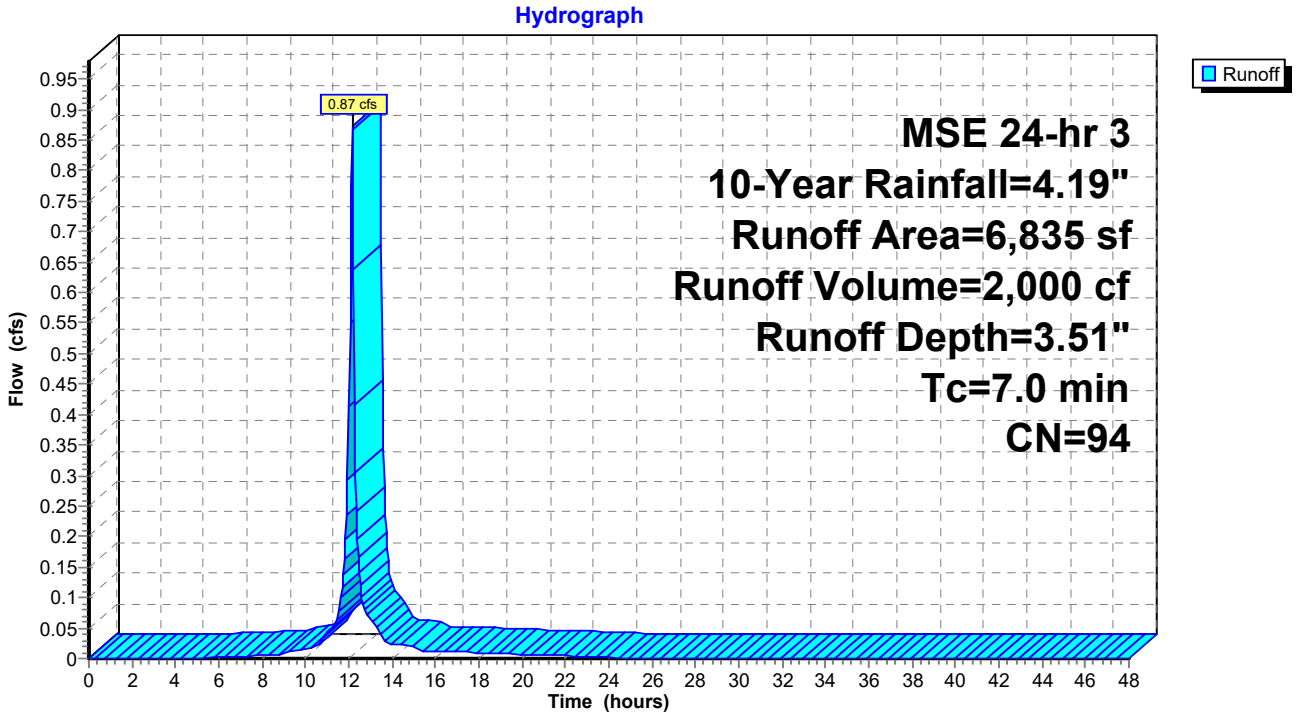
Runoff = 0.87 cfs @ 12.14 hrs, Volume= 2,000 cf, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
705	61	>75% Grass cover, Good, HSG B
6,130	98	Paved parking, HSG B
6,835	94	Weighted Average
705		10.31% Pervious Area
6,130		89.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P3: Proposed E



Summary for Subcatchment P4: Proposed SE

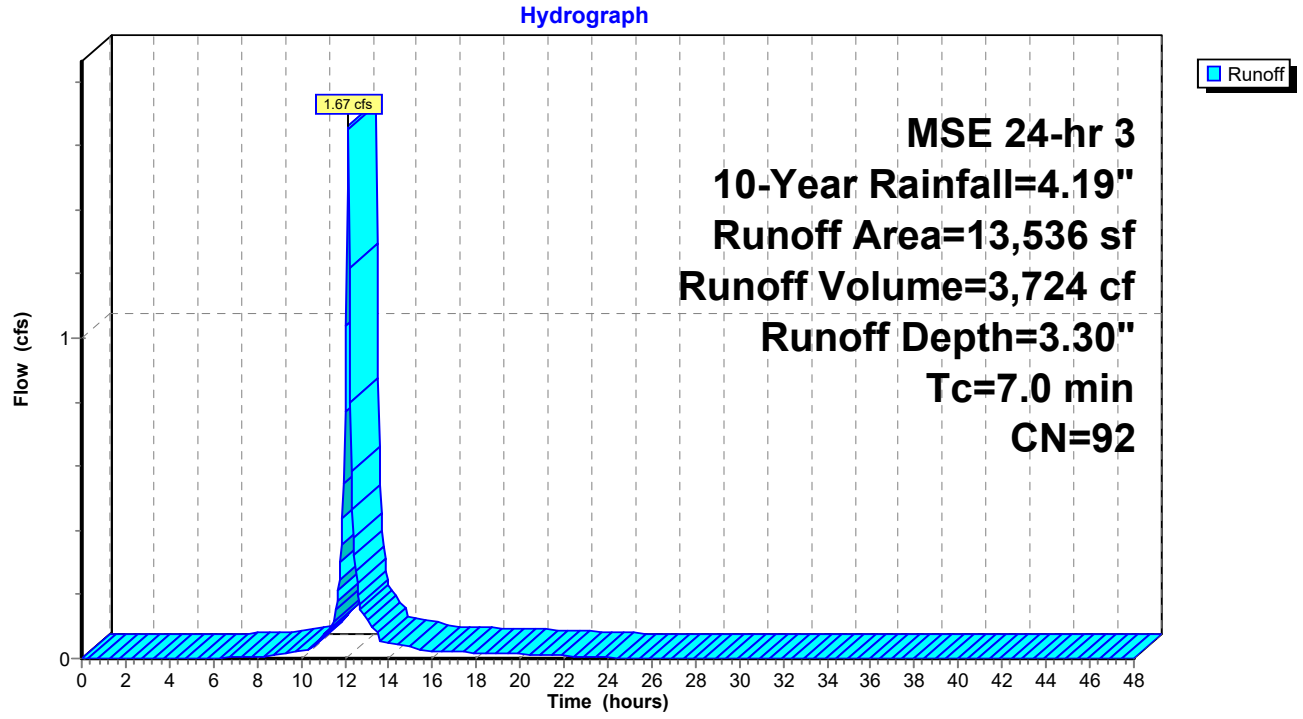
Runoff = 1.67 cfs @ 12.14 hrs, Volume= 3,724 cf, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
2,310	61	>75% Grass cover, Good, HSG B
11,226	98	Paved parking, HSG B
13,536	92	Weighted Average
2,310		17.07% Pervious Area
11,226		82.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P4: Proposed SE



Summary for Subcatchment P5: Proposed SW

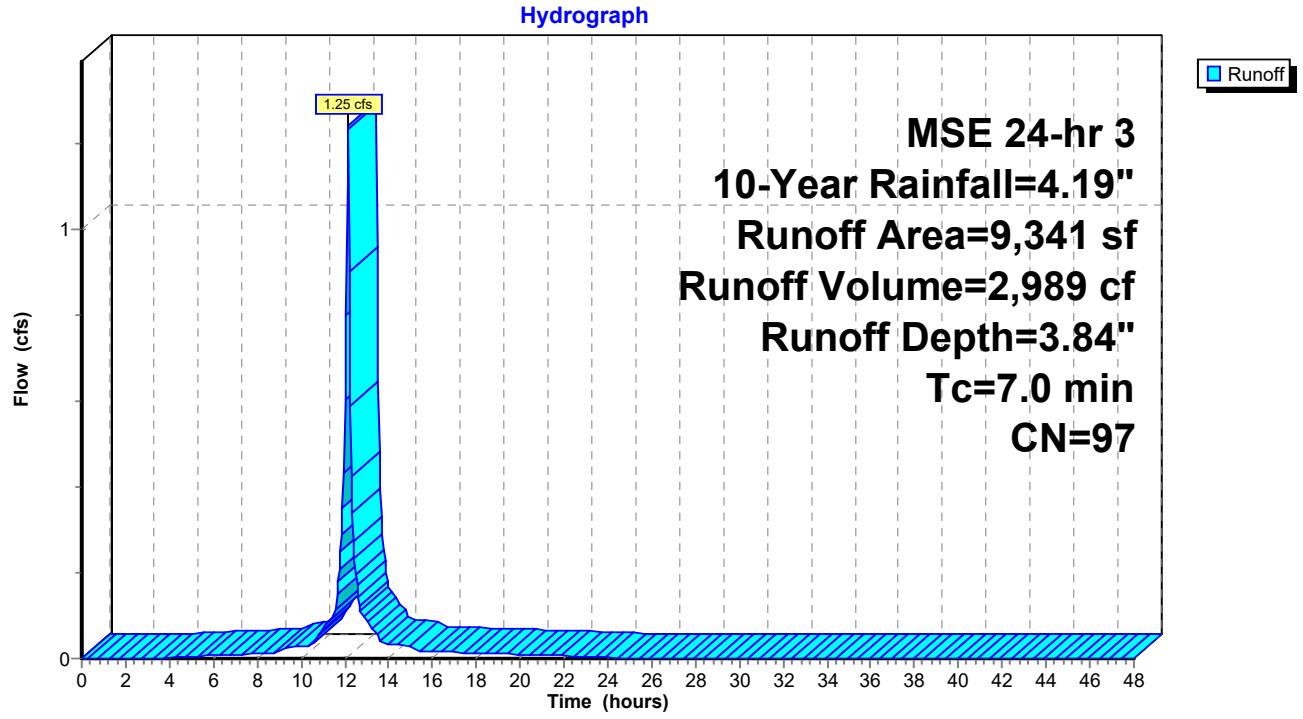
Runoff = 1.25 cfs @ 12.14 hrs, Volume= 2,989 cf, Depth= 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
319	61	>75% Grass cover, Good, HSG B
9,022	98	Paved parking, HSG B
9,341	97	Weighted Average
319		3.42% Pervious Area
9,022		96.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P5: Proposed SW



Summary for Subcatchment P6: Proposed Building

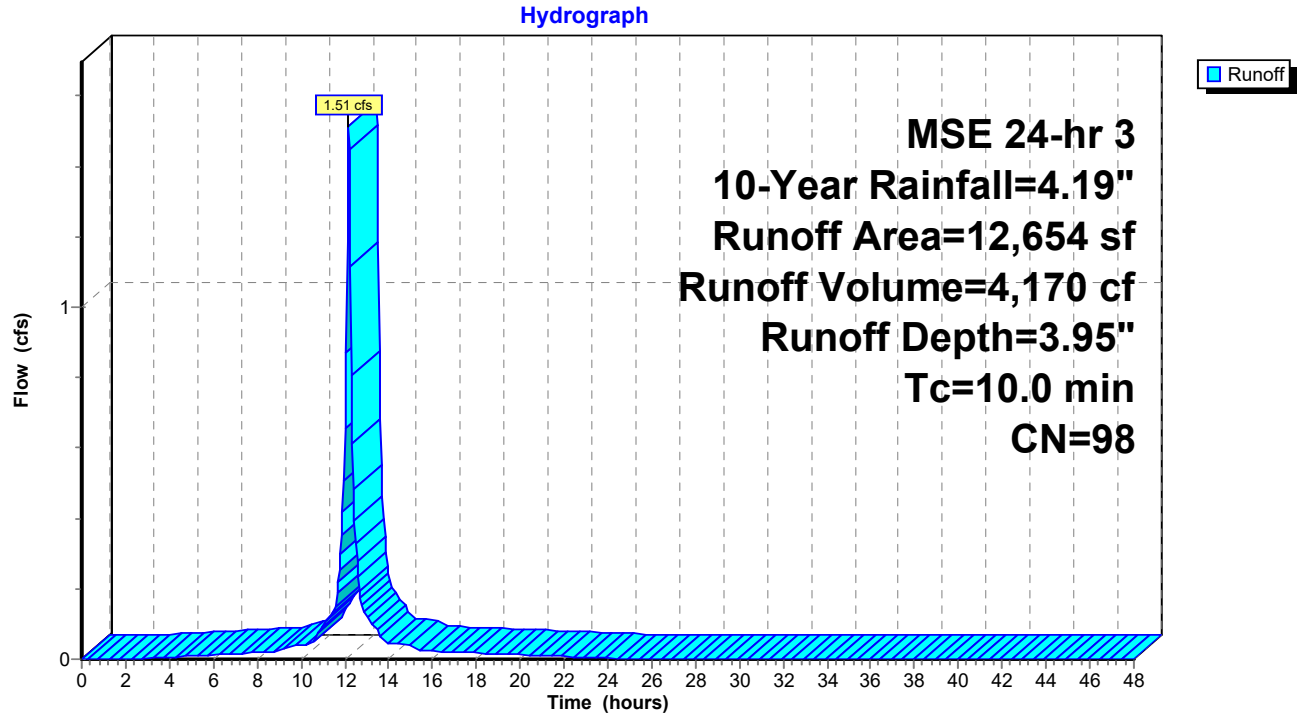
Runoff = 1.51 cfs @ 12.17 hrs, Volume= 4,170 cf, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
12,654	98	Paved parking, HSG B
12,654		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P6: Proposed Building



Summary for Subcatchment P7: Off-Site SW

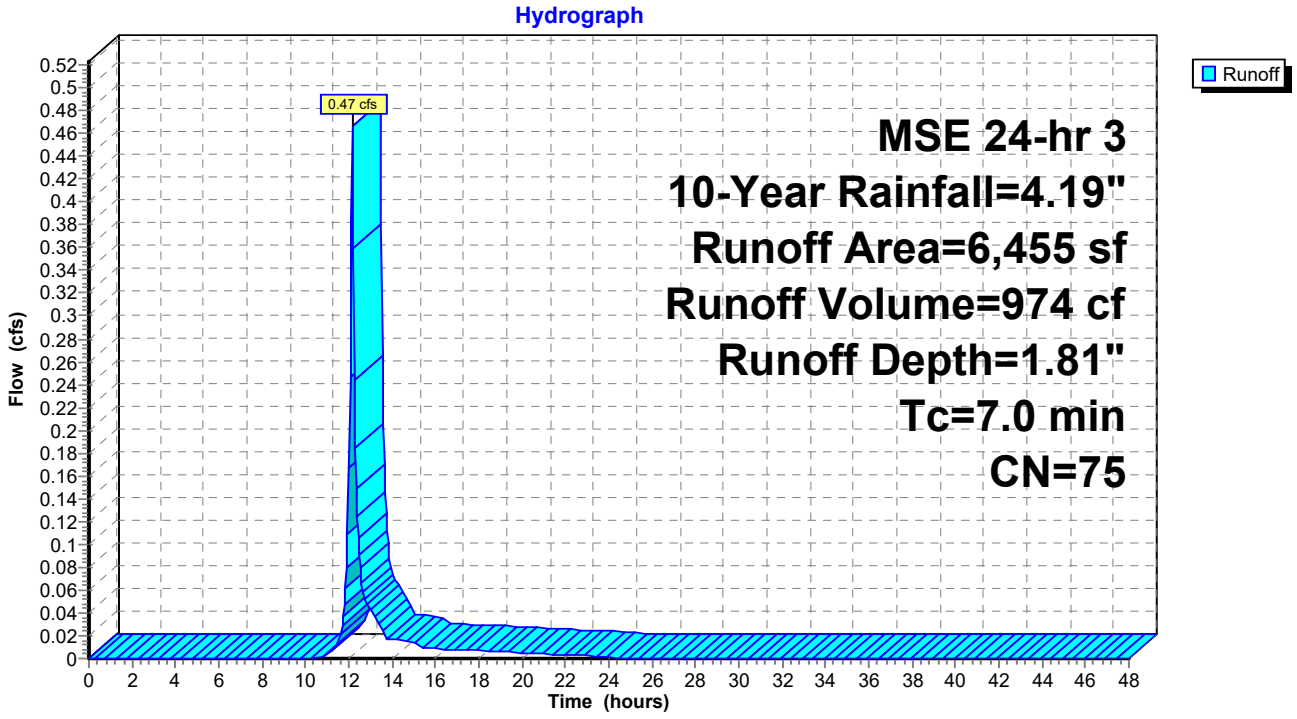
Runoff = 0.47 cfs @ 12.15 hrs, Volume= 974 cf, Depth= 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
3,940	61	>75% Grass cover, Good, HSG B
2,515	98	Paved parking, HSG B
6,455	75	Weighted Average
3,940		61.04% Pervious Area
2,515		38.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P7: Off-Site SW



Summary for Subcatchment P8: Off-Site E

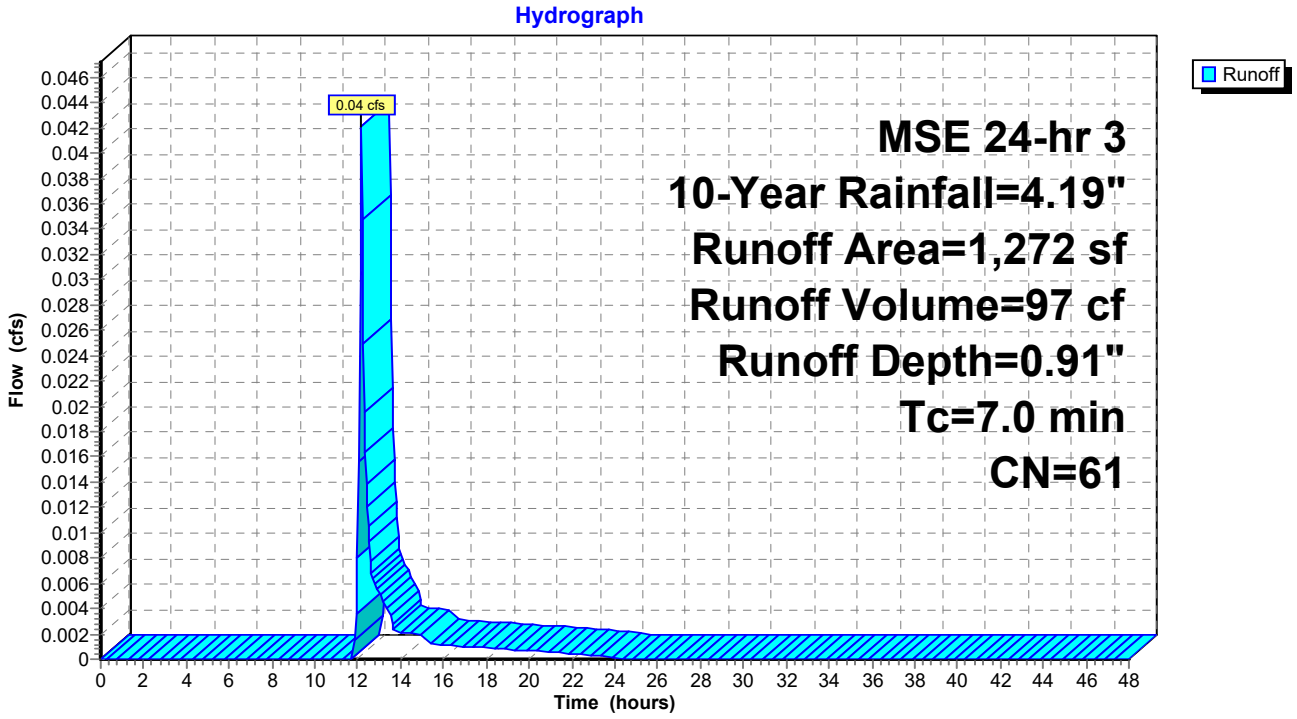
Runoff = 0.04 cfs @ 12.16 hrs, Volume= 97 cf, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.19"

Area (sf)	CN	Description
1,272	61	>75% Grass cover, Good, HSG B
1,272		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P8: Off-Site E



Summary for Pond 1P: Subsurface System

Inflow Area = 65,444 sf, 89.13% Impervious, Inflow Depth = 3.53" for 10-Year event
Inflow = 8.09 cfs @ 12.14 hrs, Volume= 19,232 cf
Outflow = 2.33 cfs @ 12.37 hrs, Volume= 18,987 cf, Atten= 71%, Lag= 13.4 min
Discarded = 0.07 cfs @ 9.25 hrs, Volume= 10,999 cf
Primary = 2.26 cfs @ 12.37 hrs, Volume= 7,988 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 921.93' @ 12.37 hrs Surf.Area= 4,032 sf Storage= 9,739 cf

Plug-Flow detention time= 535.0 min calculated for 18,967 cf (99% of inflow)
Center-of-Mass det. time= 528.3 min (1,295.5 - 767.2)

Volume	Invert	Avail.Storage	Storage Description
#1	925.25'	2,074 cf	**Low Inlet Overflow (Prismatic)** Listed below (Recalc)
#2A	918.50'	5,655 cf	**29.92'W x 134.76'L x 5.50'H Field A** 22,174 cf Overall - 8,036 cf Embedded = 14,138 cf x 40.0% Voids
#3A	919.25'	8,036 cf	**ADS_StormTech MC-3500 d +Cap** x 72 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 4 Rows of 18 Chambers Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf
		15,765 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
925.25	13	0	0
926.00	650	249	249
927.00	3,000	1,825	2,074

Device	Routing	Invert	Outlet Devices
#1	Primary	921.00'	**15.0" Round Culvert** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 921.00' / 920.96' S= 0.0040 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Discarded	918.50'	**0.800 in/hr Exfiltration over Surface area**
#3	Secondary	925.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.07 cfs @ 9.25 hrs HW=918.59' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.24 cfs @ 12.37 hrs HW=921.93' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 2.24 cfs @ 3.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=918.50' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 1P: Subsurface System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

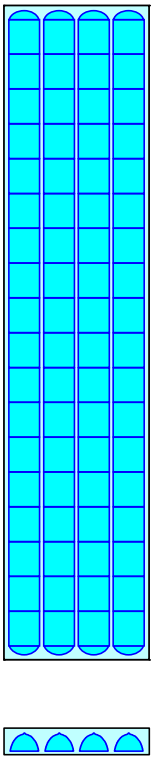
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

72 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 8,035.7 cf Chamber Storage

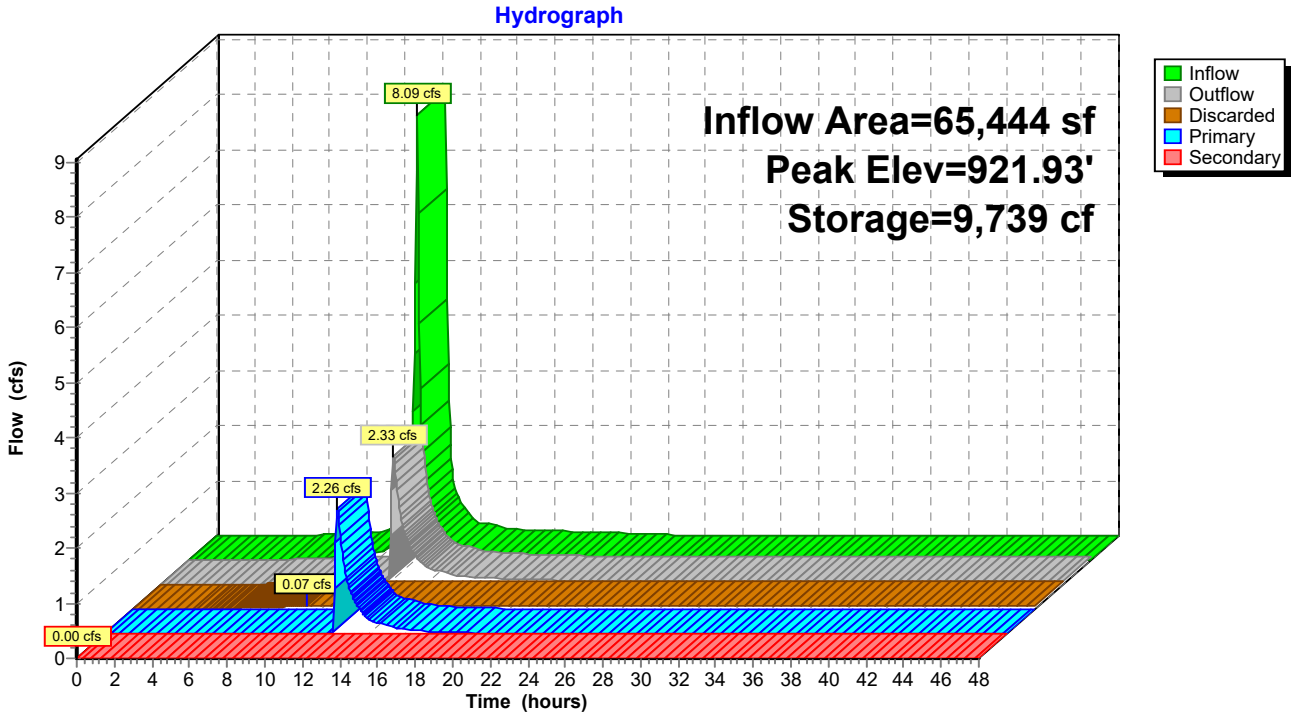
22,173.6 cf Field - 8,035.7 cf Chambers = 14,137.9 cf Stone x 40.0% Voids = 5,655.2 cf Stone Storage

Chamber Storage + Stone Storage = 13,690.9 cf = 0.314 af
Overall Storage Efficiency = 61.7%
Overall System Size = 134.76' x 29.92' x 5.50'

72 Chambers
821.2 cy Field
523.6 cy Stone



Pond 1P: Subsurface System



Stage-Area-Storage for Pond 1P: Subsurface System

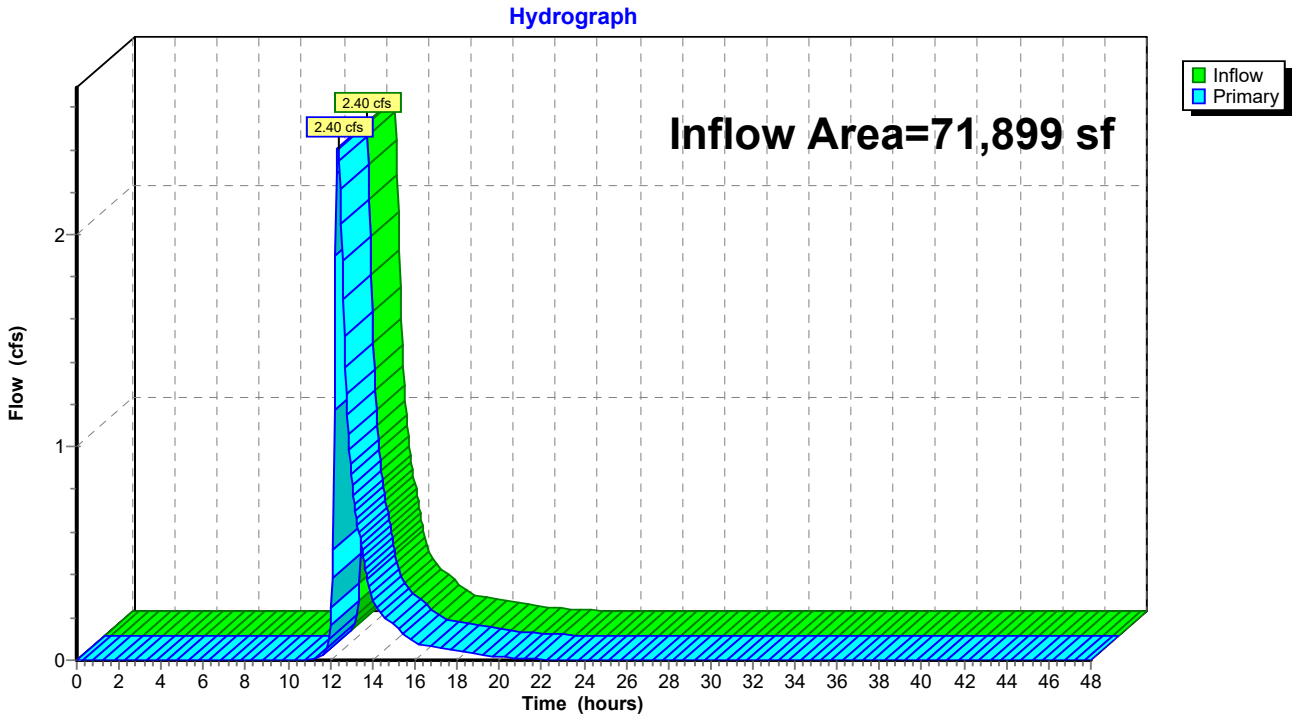
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
918.50	4,032	0
918.60	4,032	161
918.70	4,032	323
918.80	4,032	484
918.90	4,032	645
919.00	4,032	806
919.10	4,032	968
919.20	4,032	1,129
919.30	4,032	1,382
919.40	4,032	1,727
919.50	4,032	2,070
919.60	4,032	2,412
919.70	4,032	2,753
919.80	4,032	3,092
919.90	4,032	3,430
920.00	4,032	3,766
920.10	4,032	4,100
920.20	4,032	4,433
920.30	4,032	4,763
920.40	4,032	5,092
920.50	4,032	5,418
920.60	4,032	5,742
920.70	4,032	6,063
920.80	4,032	6,382
920.90	4,032	6,698
921.00	4,032	7,010
921.10	4,032	7,320
921.20	4,032	7,626
921.30	4,032	7,929
921.40	4,032	8,228
921.50	4,032	8,523
921.60	4,032	8,813
921.70	4,032	9,098
921.80	4,032	9,379
921.90	4,032	9,654
922.00	4,032	9,923
922.10	4,032	10,186
922.20	4,032	10,441
922.30	4,032	10,689
922.40	4,032	10,927
922.50	4,032	11,154
922.60	4,032	11,366
922.70	4,032	11,560
922.80	4,032	11,740
922.90	4,032	11,913
923.00	4,032	12,078
923.10	4,032	12,240
923.20	4,032	12,401
923.30	4,032	12,562
923.40	4,032	12,723
923.50	4,032	12,885
923.60	4,032	13,046
923.70	4,032	13,207
923.80	4,032	13,368
923.90	4,032	13,530
924.00	4,032	13,691
924.10	4,032	13,691
924.20	4,032	13,691
924.30	4,032	13,691
924.40	4,032	13,691
924.50	4,032	13,691
924.60	4,032	13,691
924.70	4,032	13,691
924.80	4,032	13,691
924.90	4,032	13,691
925.00	4,032	13,691
925.10	4,032	13,691
925.20	4,032	13,691
925.30	4,087	13,693
925.40	4,172	13,702
925.50	4,257	13,721
925.60	4,342	13,747
925.70	4,427	13,783
925.80	4,512	13,827
925.90	4,597	13,879
926.00	4,682	13,940
926.10	4,917	14,016
926.20	5,152	14,117
926.30	5,387	14,240
926.40	5,622	14,388
926.50	5,857	14,558
926.60	6,092	14,753
926.70	6,327	14,970
926.80	6,562	15,212
926.90	6,797	15,476
927.00	**7,032**	**15,765**

Summary for Link 1L: SW Total

Inflow Area = 71,899 sf, 84.63% Impervious, Inflow Depth = 1.50" for 10-Year event
Inflow = 2.40 cfs @ 12.36 hrs, Volume= 8,962 cf
Primary = 2.40 cfs @ 12.36 hrs, Volume= 8,962 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1L: SW Total

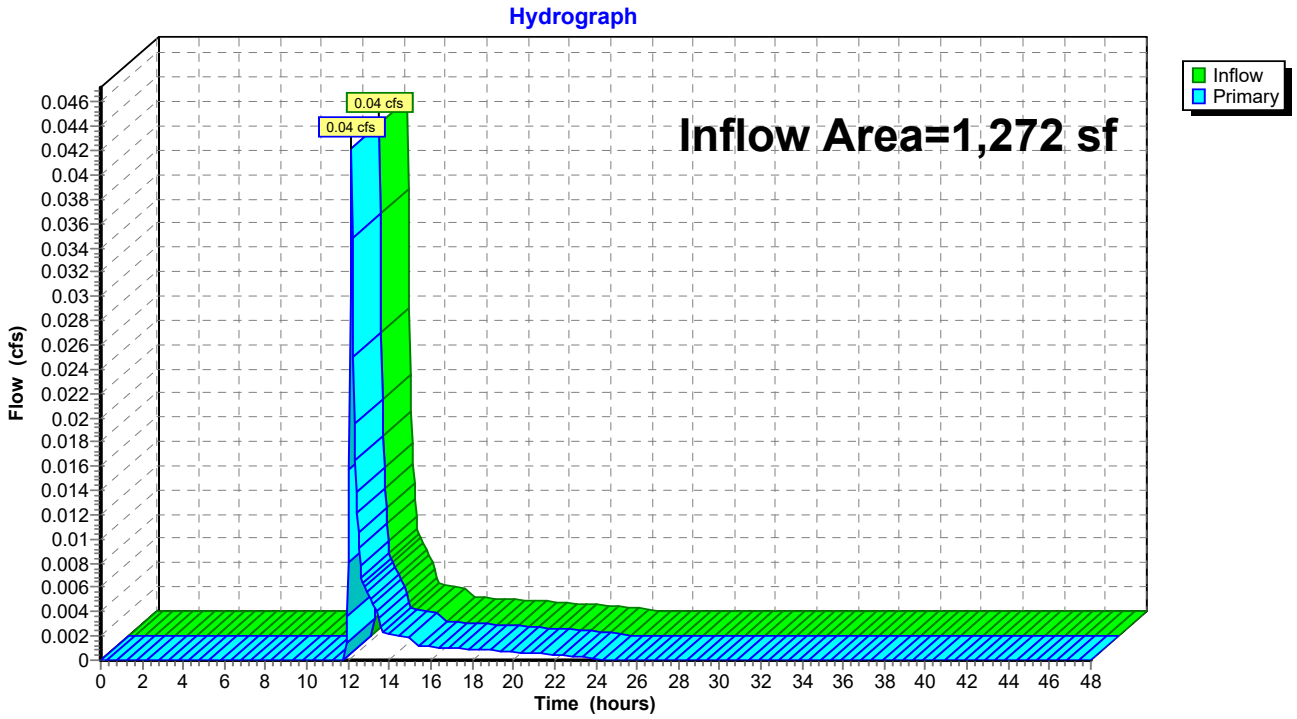


Summary for Link 3L: E Total

Inflow Area = 1,272 sf, 0.00% Impervious, Inflow Depth = 0.91" for 10-Year event
Inflow = 0.04 cfs @ 12.16 hrs, Volume= 97 cf
Primary = 0.04 cfs @ 12.16 hrs, Volume= 97 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 3L: E Total



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: Proposed NW Runoff Area=10,395 sf 83.88% Impervious Runoff Depth=6.41"
Tc=7.0 min CN=92 Runoff=2.38 cfs 5,553 cf

Subcatchment P2: Proposed NE Runoff Area=12,683 sf 83.43% Impervious Runoff Depth=6.41"
Tc=7.0 min CN=92 Runoff=2.91 cfs 6,775 cf

Subcatchment P3: Proposed E Runoff Area=6,835 sf 89.69% Impervious Runoff Depth=6.65"
Tc=7.0 min CN=94 Runoff=1.59 cfs 3,785 cf

Subcatchment P4: Proposed SE Runoff Area=13,536 sf 82.93% Impervious Runoff Depth=6.41"
Tc=7.0 min CN=92 Runoff=3.10 cfs 7,231 cf

Subcatchment P5: Proposed SW Runoff Area=9,341 sf 96.58% Impervious Runoff Depth=7.00"
Tc=7.0 min CN=97 Runoff=2.21 cfs 5,450 cf

Subcatchment P6: Proposed Building Runoff Area=12,654 sf 100.00% Impervious Runoff Depth=7.12"
Tc=10.0 min CN=98 Runoff=2.67 cfs 7,509 cf

Subcatchment P7: Off-Site SW Runoff Area=6,455 sf 38.96% Impervious Runoff Depth=4.47"
Tc=7.0 min CN=75 Runoff=1.14 cfs 2,403 cf

Subcatchment P8: Off-Site E Runoff Area=1,272 sf 0.00% Impervious Runoff Depth=2.96"
Tc=7.0 min CN=61 Runoff=0.15 cfs 314 cf

Pond 1P: Subsurface System Peak Elev=924.17' Storage=13,691 cf Inflow=14.77 cfs 36,303 cf
Discarded=0.07 cfs 11,630 cf Primary=9.43 cfs 24,065 cf Secondary=0.00 cfs 0 cf Outflow=9.50 cfs 35,695 cf

Link 1L: SW Total Inflow=10.07 cfs 26,468 cf
Primary=10.07 cfs 26,468 cf

Link 3L: E Total Inflow=0.15 cfs 314 cf
Primary=0.15 cfs 314 cf

Total Runoff Area = 73,171 sf Runoff Volume = 39,021 cf Average Runoff Depth = 6.40"
16.84% Pervious = 12,324 sf 83.16% Impervious = 60,847 sf

Summary for Subcatchment P1: Proposed NW

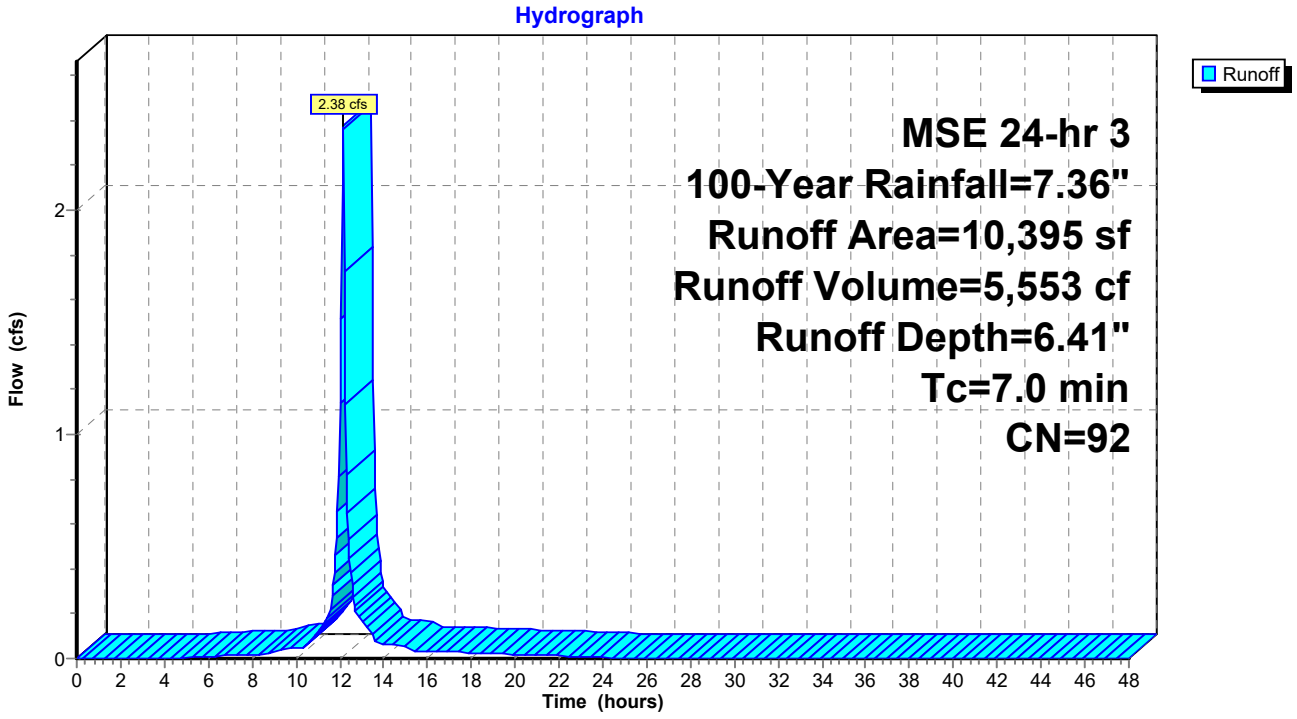
Runoff = 2.38 cfs @ 12.14 hrs, Volume= 5,553 cf, Depth= 6.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
1,676	61	>75% Grass cover, Good, HSG B
8,719	98	Paved parking, HSG B
10,395	92	Weighted Average
1,676		16.12% Pervious Area
8,719		83.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P1: Proposed NW



Summary for Subcatchment P2: Proposed NE

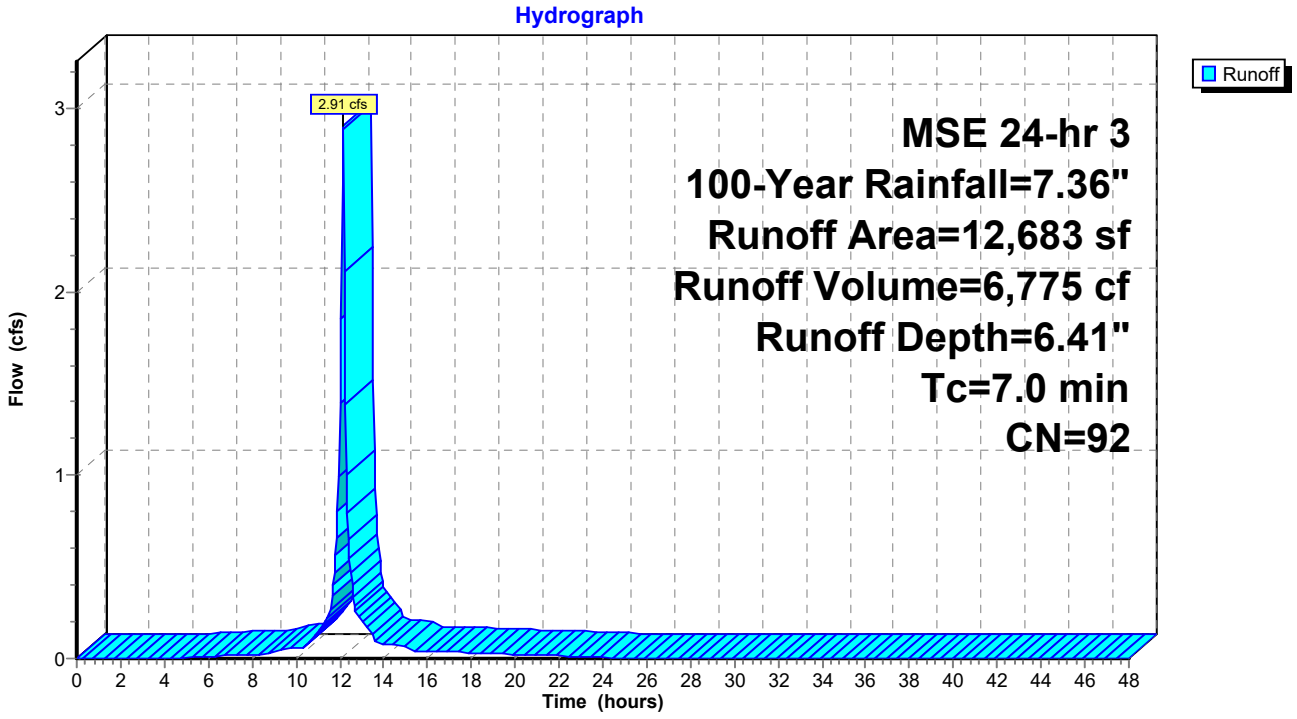
Runoff = 2.91 cfs @ 12.14 hrs, Volume= 6,775 cf, Depth= 6.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
2,102	61	>75% Grass cover, Good, HSG B
10,581	98	Paved parking, HSG B
12,683	92	Weighted Average
2,102		16.57% Pervious Area
10,581		83.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P2: Proposed NE



Summary for Subcatchment P3: Proposed E

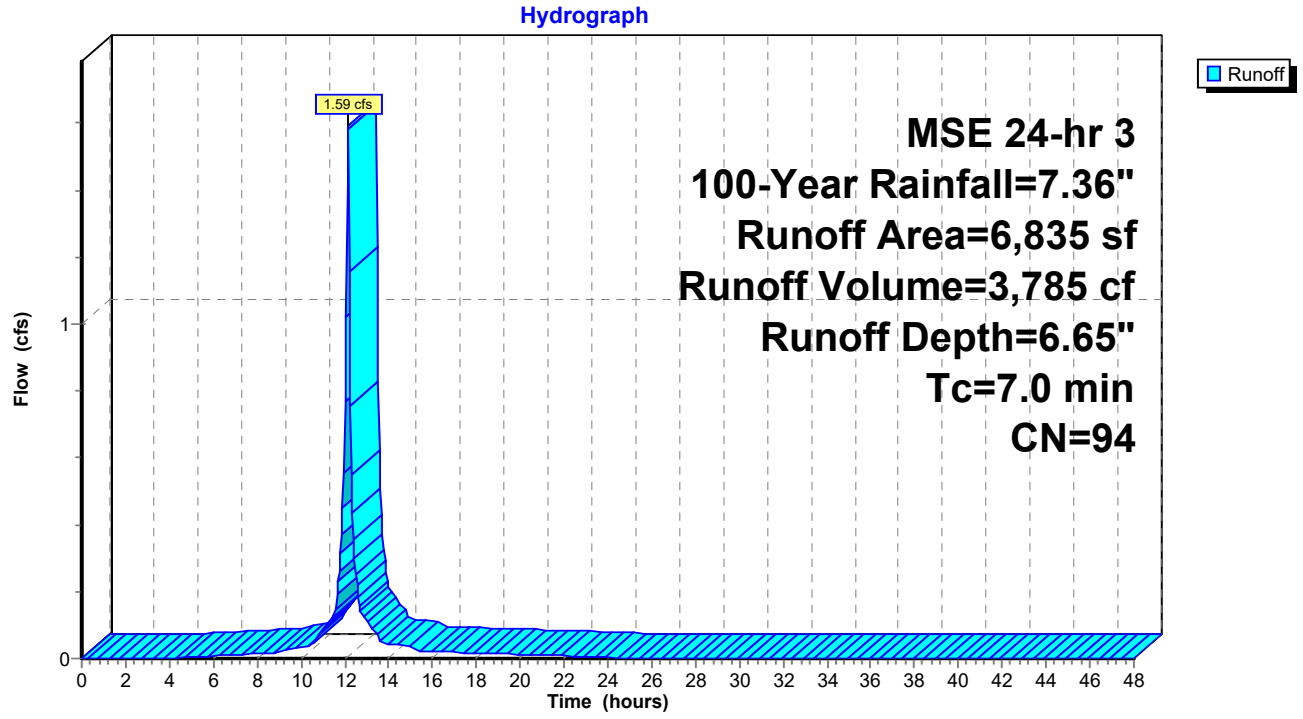
Runoff = 1.59 cfs @ 12.14 hrs, Volume= 3,785 cf, Depth= 6.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
705	61	>75% Grass cover, Good, HSG B
6,130	98	Paved parking, HSG B
6,835	94	Weighted Average
705		10.31% Pervious Area
6,130		89.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P3: Proposed E



Summary for Subcatchment P4: Proposed SE

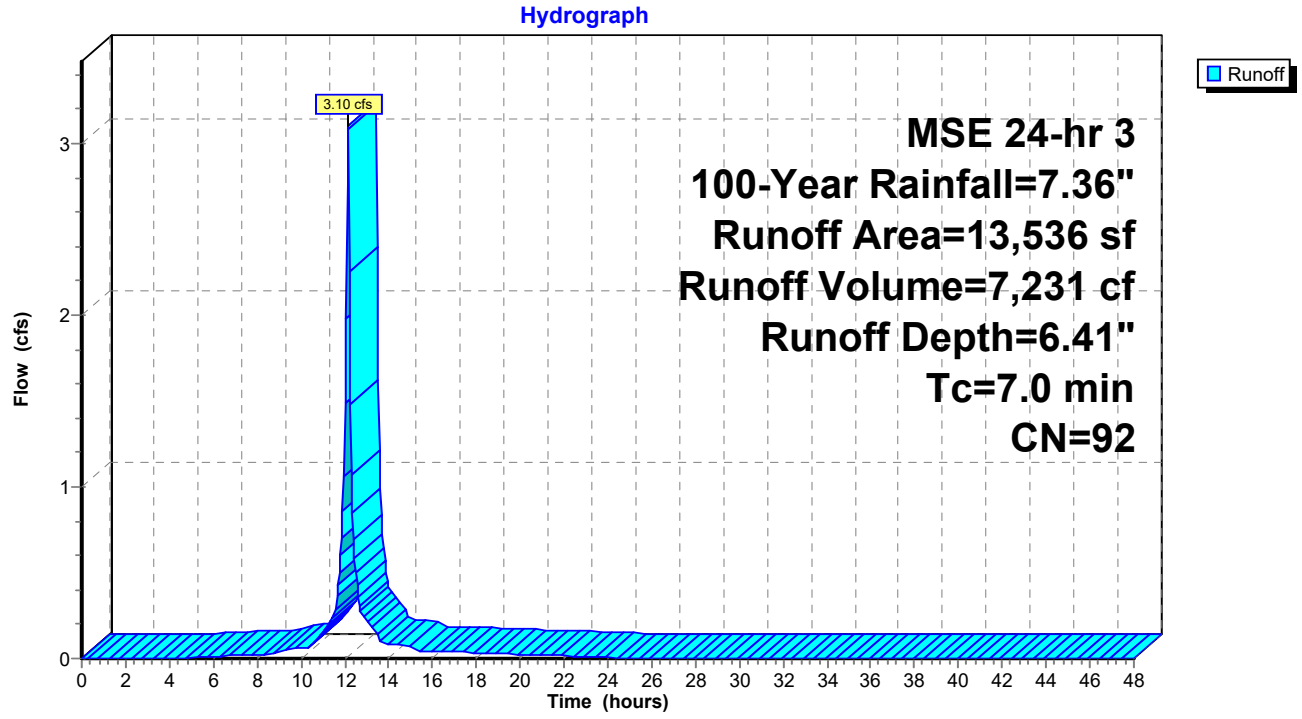
Runoff = 3.10 cfs @ 12.14 hrs, Volume= 7,231 cf, Depth= 6.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
2,310	61	>75% Grass cover, Good, HSG B
11,226	98	Paved parking, HSG B
13,536	92	Weighted Average
2,310		17.07% Pervious Area
11,226		82.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P4: Proposed SE



Summary for Subcatchment P5: Proposed SW

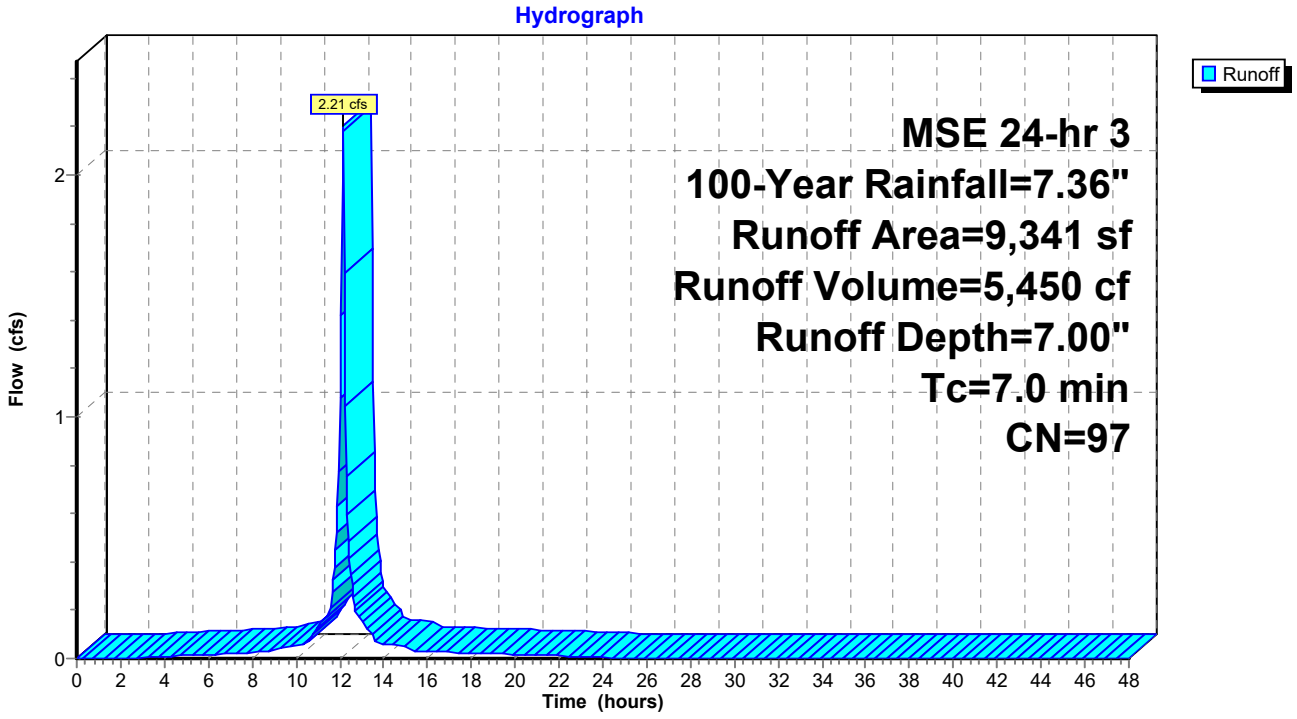
Runoff = 2.21 cfs @ 12.14 hrs, Volume= 5,450 cf, Depth= 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
319	61	>75% Grass cover, Good, HSG B
9,022	98	Paved parking, HSG B
9,341	97	Weighted Average
319		3.42% Pervious Area
9,022		96.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P5: Proposed SW



Summary for Subcatchment P6: Proposed Building

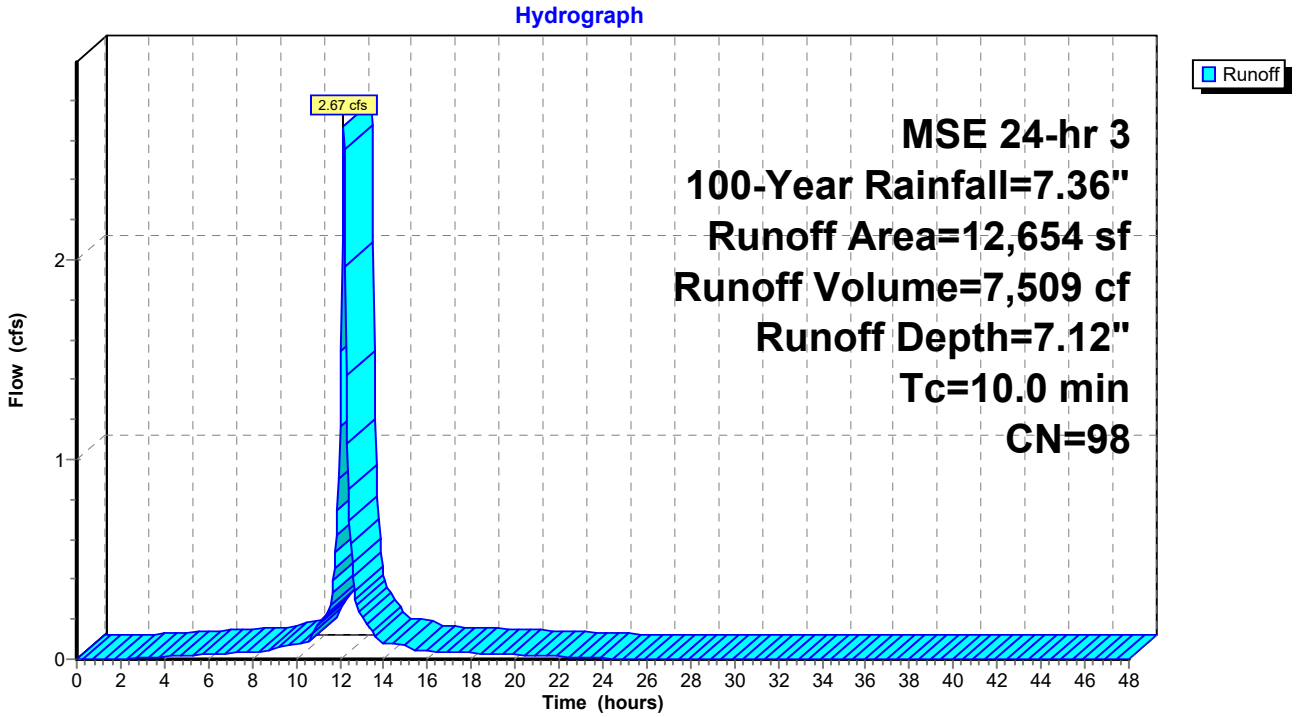
Runoff = 2.67 cfs @ 12.17 hrs, Volume= 7,509 cf, Depth= 7.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
12,654	98	Paved parking, HSG B
12,654		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment P6: Proposed Building



Summary for Subcatchment P7: Off-Site SW

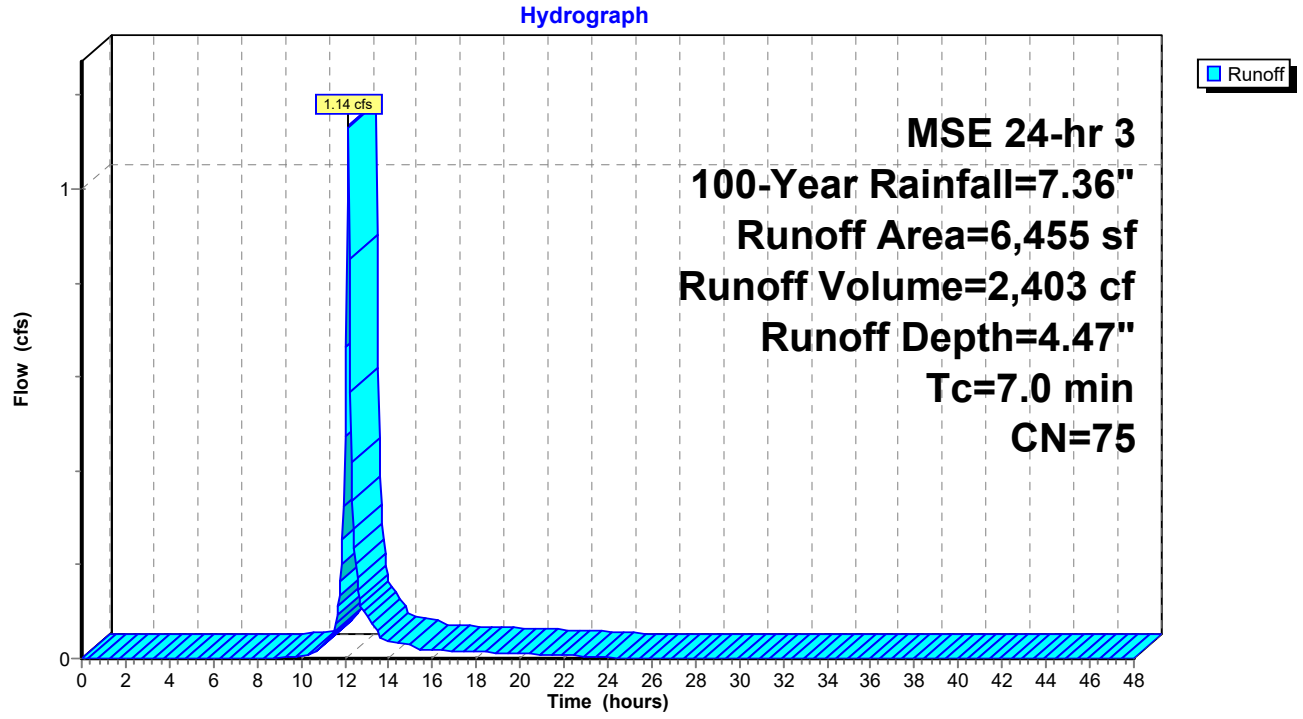
Runoff = 1.14 cfs @ 12.14 hrs, Volume= 2,403 cf, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
3,940	61	>75% Grass cover, Good, HSG B
2,515	98	Paved parking, HSG B
6,455	75	Weighted Average
3,940		61.04% Pervious Area
2,515		38.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P7: Off-Site SW



Summary for Subcatchment P8: Off-Site E

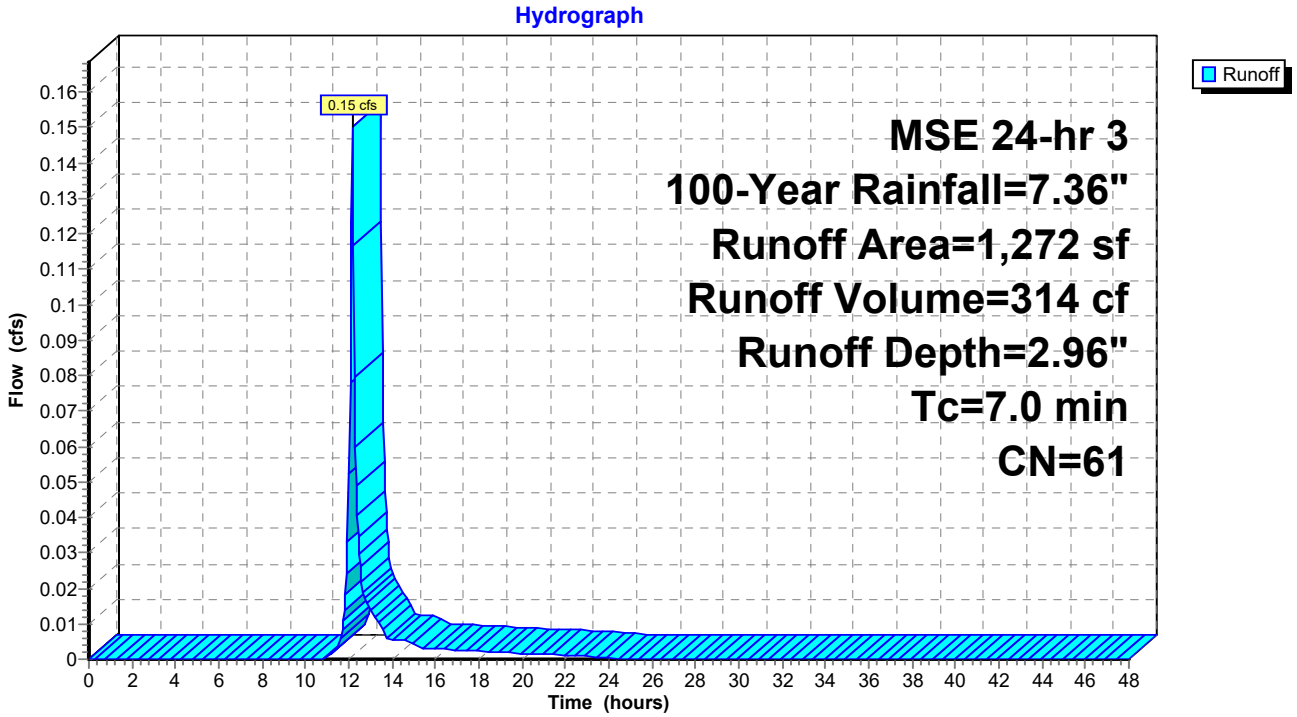
Runoff = 0.15 cfs @ 12.15 hrs, Volume= 314 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.36"

Area (sf)	CN	Description
1,272	61	>75% Grass cover, Good, HSG B
1,272		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment P8: Off-Site E



Summary for Pond 1P: Subsurface System

Inflow Area = 65,444 sf, 89.13% Impervious, Inflow Depth = 6.66" for 100-Year event
Inflow = 14.77 cfs @ 12.14 hrs, Volume= 36,303 cf
Outflow = 9.50 cfs @ 12.24 hrs, Volume= 35,695 cf, Atten= 36%, Lag= 5.9 min
Discarded = 0.07 cfs @ 6.35 hrs, Volume= 11,630 cf
Primary = 9.43 cfs @ 12.24 hrs, Volume= 24,065 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 924.17' @ 12.24 hrs Surf.Area= 4,032 sf Storage= 13,691 cf

Plug-Flow detention time= 302.3 min calculated for 35,658 cf (98% of inflow)
Center-of-Mass det. time= 293.6 min (1,050.4 - 756.8)

Volume	Invert	Avail.Storage	Storage Description
#1	925.25'	2,074 cf	**Low Inlet Overflow (Prismatic)** Listed below (Recalc)
#2A	918.50'	5,655 cf	**29.92'W x 134.76'L x 5.50'H Field A** 22,174 cf Overall - 8,036 cf Embedded = 14,138 cf x 40.0% Voids
#3A	919.25'	8,036 cf	**ADS_StormTech MC-3500 d +Cap** x 72 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 4 Rows of 18 Chambers Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf
		15,765 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
925.25	13	0	0
926.00	650	249	249
927.00	3,000	1,825	2,074

Device	Routing	Invert	Outlet Devices
#1	Primary	921.00'	**15.0" Round Culvert** L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 921.00' / 920.96' S= 0.0040 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Discarded	918.50'	**0.800 in/hr Exfiltration over Surface area**
#3	Secondary	925.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.07 cfs @ 6.35 hrs HW=918.59' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=9.34 cfs @ 12.24 hrs HW=924.12' (Free Discharge)
└**1=Culvert** (Inlet Controls 9.34 cfs @ 7.61 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=918.50' (Free Discharge)
└**3=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond 1P: Subsurface System - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

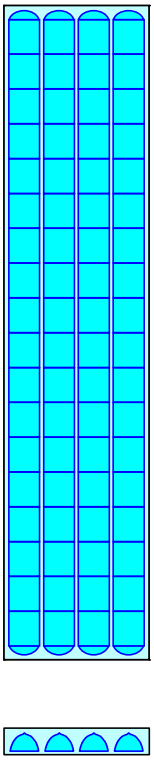
18 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 132.76' Row Length +12.0" End Stone x 2 = 134.76' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Base + 45.0" Chamber Height + 12.0" Cover = 5.50' Field Height

72 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 8,035.7 cf Chamber Storage

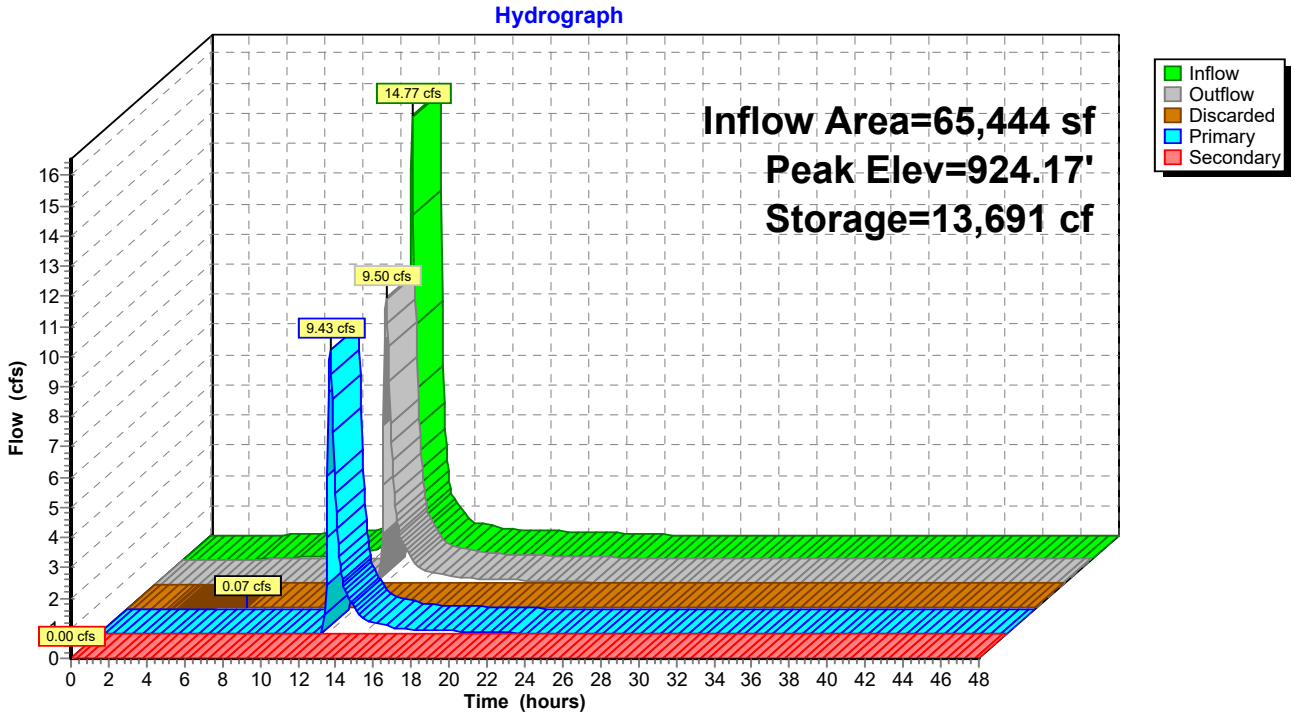
22,173.6 cf Field - 8,035.7 cf Chambers = 14,137.9 cf Stone x 40.0% Voids = 5,655.2 cf Stone Storage

Chamber Storage + Stone Storage = 13,690.9 cf = 0.314 af
Overall Storage Efficiency = 61.7%
Overall System Size = 134.76' x 29.92' x 5.50'

72 Chambers
821.2 cy Field
523.6 cy Stone



Pond 1P: Subsurface System



Stage-Area-Storage for Pond 1P: Subsurface System

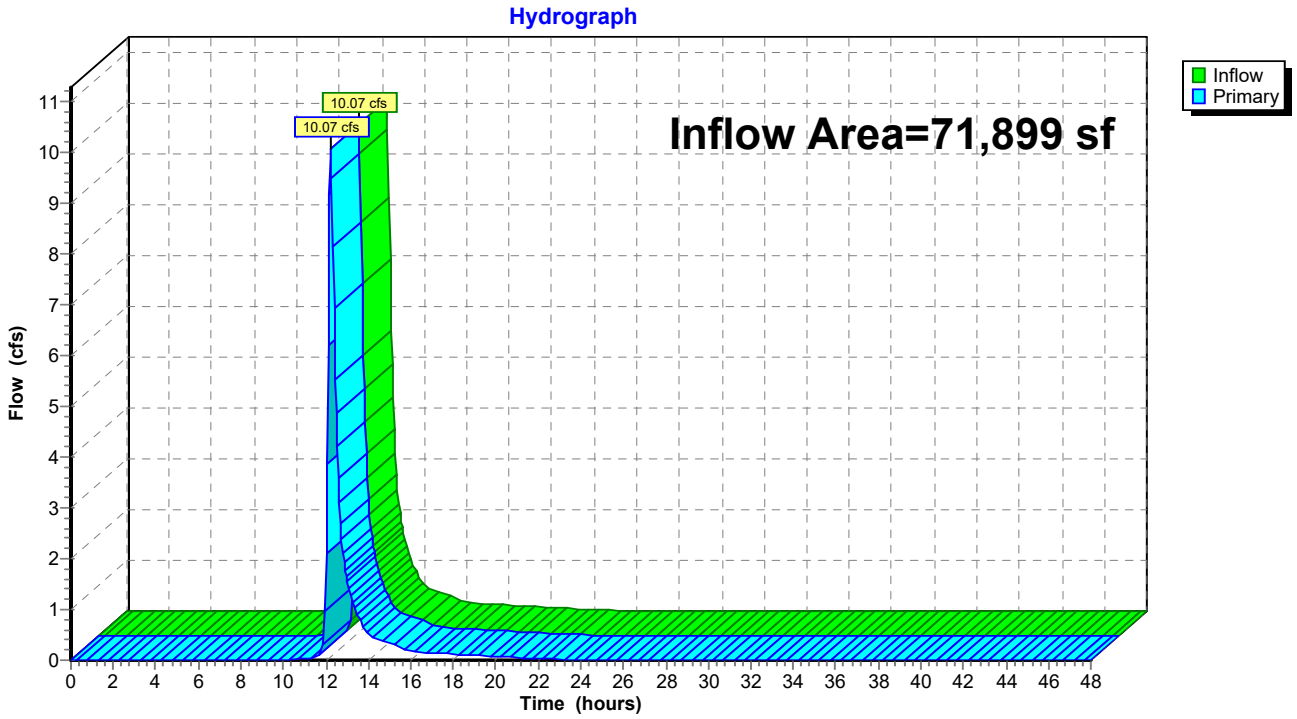
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
918.50	4,032	0
918.60	4,032	161
918.70	4,032	323
918.80	4,032	484
918.90	4,032	645
919.00	4,032	806
919.10	4,032	968
919.20	4,032	1,129
919.30	4,032	1,382
919.40	4,032	1,727
919.50	4,032	2,070
919.60	4,032	2,412
919.70	4,032	2,753
919.80	4,032	3,092
919.90	4,032	3,430
920.00	4,032	3,766
920.10	4,032	4,100
920.20	4,032	4,433
920.30	4,032	4,763
920.40	4,032	5,092
920.50	4,032	5,418
920.60	4,032	5,742
920.70	4,032	6,063
920.80	4,032	6,382
920.90	4,032	6,698
921.00	4,032	7,010
921.10	4,032	7,320
921.20	4,032	7,626
921.30	4,032	7,929
921.40	4,032	8,228
921.50	4,032	8,523
921.60	4,032	8,813
921.70	4,032	9,098
921.80	4,032	9,379
921.90	4,032	9,654
922.00	4,032	9,923
922.10	4,032	10,186
922.20	4,032	10,441
922.30	4,032	10,689
922.40	4,032	10,927
922.50	4,032	11,154
922.60	4,032	11,366
922.70	4,032	11,560
922.80	4,032	11,740
922.90	4,032	11,913
923.00	4,032	12,078
923.10	4,032	12,240
923.20	4,032	12,401
923.30	4,032	12,562
923.40	4,032	12,723
923.50	4,032	12,885
923.60	4,032	13,046
923.70	4,032	13,207
923.80	4,032	13,368
923.90	4,032	13,530
924.00	4,032	13,691
924.10	4,032	13,691
924.20	4,032	13,691
924.30	4,032	13,691
924.40	4,032	13,691
924.50	4,032	13,691
924.60	4,032	13,691
924.70	4,032	13,691
924.80	4,032	13,691
924.90	4,032	13,691
925.00	4,032	13,691
925.10	4,032	13,691
925.20	4,032	13,691
925.30	4,087	13,693
925.40	4,172	13,702
925.50	4,257	13,721
925.60	4,342	13,747
925.70	4,427	13,783
925.80	4,512	13,827
925.90	4,597	13,879
926.00	4,682	13,940
926.10	4,917	14,016
926.20	5,152	14,117
926.30	5,387	14,240
926.40	5,622	14,388
926.50	5,857	14,558
926.60	6,092	14,753
926.70	6,327	14,970
926.80	6,562	15,212
926.90	6,797	15,476
927.00	**7,032**	**15,765**

Summary for Link 1L: SW Total

Inflow Area = 71,899 sf, 84.63% Impervious, Inflow Depth = 4.42" for 100-Year event
Inflow = 10.07 cfs @ 12.23 hrs, Volume= 26,468 cf
Primary = 10.07 cfs @ 12.23 hrs, Volume= 26,468 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 1L: SW Total

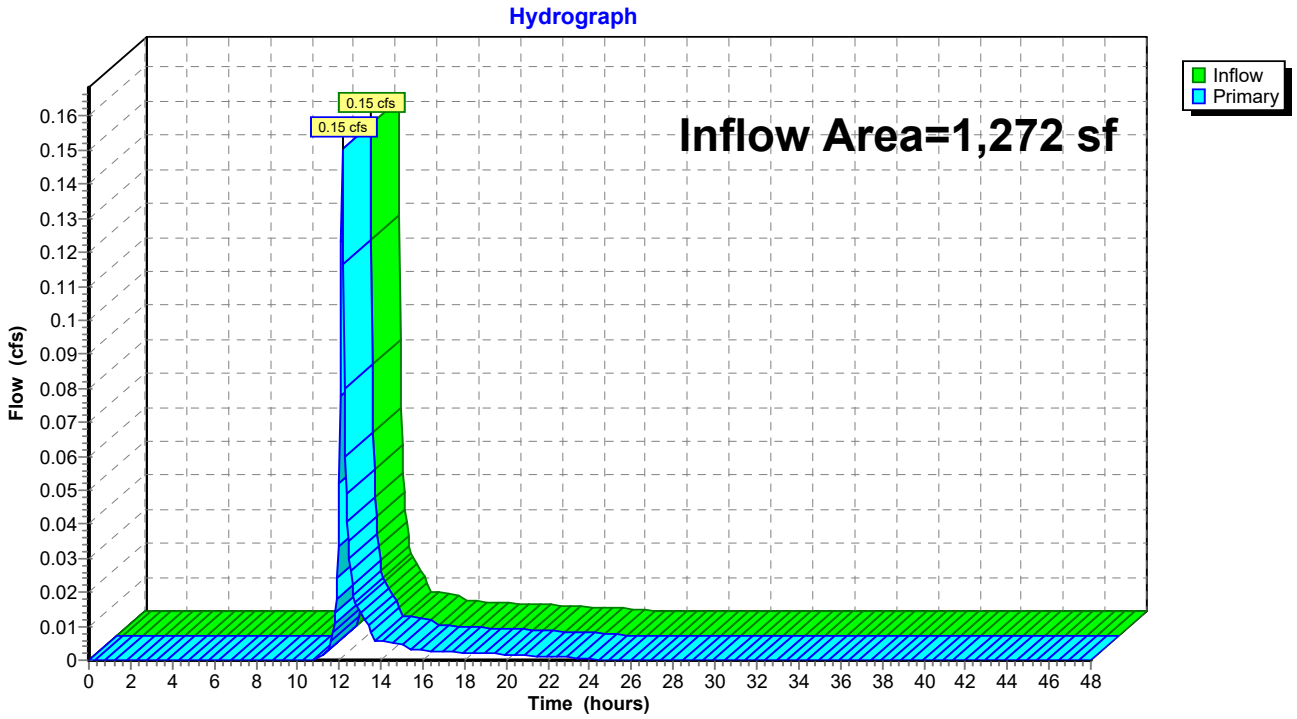


Summary for Link 3L: E Total

Inflow Area = 1,272 sf, 0.00% Impervious, Inflow Depth = 2.96" for 100-Year event
Inflow = 0.15 cfs @ 12.15 hrs, Volume= 314 cf
Primary = 0.15 cfs @ 12.15 hrs, Volume= 314 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 3L: E Total



APPENDIX D – MIDS Calculations

Project Information

Calculator Version:	Version 3: January 2017
Project Name:	Woodspring Suites Hotel
User Name / Company Name:	Sambatek
Date:	7/24/2020
Project Description:	The proposed project consists of the development of a 2.04-acre site located at 1744 County Road D in Maplewood, Ramsey County, Minnesota. The site is within the Ramsey-Washington Metro Watershed District. The proposed site consists of the construction of a 4-story Hotel and adjacent parking lots.
Construction Permit?:	Yes

Site Information

Retention Requirement (inches):	1.1
Site's Zip Code:	55109
Annual Rainfall (inches):	32
Phosphorus EMC (mg/l):	0.3
TSS EMC (mg/l):	54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed	.17				0.17
			Impervious Area (acres)		1.33
				Total Area (acres)	1.5

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed	0.17				0.17
			Impervious Area (acres)		1.33
				Total Area (acres)	1.5

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	5311	ft3
Volume removed by BMPs towards performance goal:	5311	ft^3
Percent volume removed towards performance goal	**100**	**%**

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	3.0936	acre-ft
Annual runoff volume removed by BMPs:	3.003	acre-ft
Percent annual runoff volume removed:	**97**	**%**
Post development annual particulate P load:	1.388	lbs
Annual particulate P removed by BMPs:	1.348	lbs
Post development annual dissolved P load:	1.136	lbs
Annual dissolved P removed by BMPs:	1.103	lbs
Percent annual total phosphorus removed:	**97**	**%**
Post development annual TSS load:	458.6	lbs
Annual TSS removed by BMPs:	445.2	lbs
Percent annual TSS removed:	**97**	**%**

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft3)	Volume Recieved (ft3)	Volume Retained (ft3)	Volume Outflow (ft3)	Percent Retained (%)
1 - Underground infiltration	7010	5311	5311	0	100

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
1 - Underground infiltration	3.0936	0	3.003	0.0905999999	97

Particulate Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Underground infiltration	1.3884	0	1.3478	0.0406	97

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Underground infiltration	1.136	0	1.1027	0.0333	97

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Underground infiltration	458.6	0	445.17	13.43	97

BMP Schematic